HEADQUARTERS
DEPARTMENT OF THE ARMY

FM 7-11C1/2

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SOLDIER'S MANUAL

11C10 - INDIRECT FIRE INFANTRYMAN
11C20

United States / War Dept / Field Manuals /

VWZY

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COMMANDER'S ATTENTION

Distribute this manual to each soldier in MOS 11C Skill Levels 1-4.

This Soldier's Manual is designed to tell the soldier what tasks he must be proficient in to be MOS qualified. If the soldier follows the road map it provides, he should progress readily to positions of responsibility commensurate with his aptitude and motivation.

Initial distribution of Soldier's Manuals will be "pushed" down to the unit level, based upon assigned strength in the particular MOS and skill level. If additional manuals are needed by the unit for MOS study, libraries, or other training needs, requests for publications may be sent directly to the US Army Publications Center, 2800 Eastern Boulevard, Baltimore, Maryland 21220.

Soldier's Manuals are designed on the modular system. Each skill level manual builds upon another. As an example, a skill level 3 soldier needs manuals 1 through 4. Levels 1 through 3 tell the level 3 soldier what he needs to know for proficiency at his present skill level. The skill level 4 manual tells him what he must be able to do at the next skill level. The point is—he needs all 4 manuals to know all he needs to know.

The individual soldier is responsible for retaining and maintaining his manual. Upon promotion to grades E5, E6, E7, or E8, the soldier must order his next higher level manual directly from the preparing agency.

To comply with guidance of the Assistant Secretary of Defense (Manpower and Reserve Affairs), this Soldier's Manual has been reviewed for the use of neuter language. Unless otherwise noted, the third person singular "he" stands for both masculine and feminine genders.

This Soldier's Manual was prepared by the US Army Infantry School.

WILLIAM J. LIVSEY
Major General, USA
Commandant

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RESERVE COMPONENT COMMANDER

ARMY NATIONAL GUARD ARMY RESERVI

The information on this page is for you, the Reserve/Guard component commande Although this manual lists the critical tasks to be performed by the Active Army soldier in their MOS on equipment available in the Active Army inventory, most tasks in thi manual are applicable to reservists/guardsmen without changes. However, some task may require modification because of differences in equipment, facilities, and trainin time available. Because of these differences, you as a Reserve/Guard compone commander, will need to be innovative and seek ways to enable your soldiers accomplish their critical tasks.

This manual has not undergone the review process necessary to make it complete applicable to Reserve/Guard components. However, some Reserve/Guard compone tasks have been identified. In the meantime, Reserve/Guard components will be usi the manual prepared for their Active Army counterpart. As necessary, change shee will be published and distributed to your unit.

Many tasks learned in basic combat training and advanced individual training are this manual. There are other critical tasks that your reservists/guardsmen must lea on their own. Study materials have been prepared and can be ordered from the propone agency. Your job is to make sure that the necessary study materials are available in yo unit training center.

NOTICE TO RESERVE COMPONENTS

This manual will not be effective for the Army National Guard and Army Reserve u ***after*** the 1979 SQT. ***Do not*** (repeat ***do not***) destroy FM 7-11C1, dated 30 July 1976 a FM 7-11C2, dated 30 July 1976. Your SQT in 1979 will be based on FM 7-11C1, da 30 July 1976 and FM 7-11C2, dated 30 July 1976.

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Field Manual
No. 7-11C1/2

*FM 7-11C1/2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 7 July 1978

SOLDIER'S MANUAL 11C
INDIRECT FIRE INFANTRYMAN SKILL LEVEL 1/2

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For sale by the Superintendent of Documents, U.S. Government Printing Office
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Stock Number 008-020-00748-0

*This field manual supersedes Field Manual 7-11C1, dated 30 July 1976 and Field Manual 7-11C2, dated 30 July 1976.

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CHAPTER 1

INDIRECT FIRE INFANTRYMAN

SECTION I
SKILL LEVEL ONE
INTRODUCTION AND ROAD MAP

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WHAT IS A SOLDIER'S MANUAL?

PERFORMANCE COUNTS

IN COMBAT, PERFORMANCE COUNTS. The job of an Infantryman in combat isn't easy. In fact, it's one of the hardest jobs you'll ever learn. You must have confidence, ability, and conditioning to be an Infantryman - a professional in the combat arms!

DO YOU KNOW YOUR JOB? Everyone likes to think he knows how to do his job. But those who think they know and those who really know are not always the same. First, you have to know what **TASKS** you are expected to do as an Infantryman in combat. Then you need to know the battlefield **CONDITIONS** under which you are going to do those tasks and how well **(STANDARDS)** you must be able to do them. This manual tells you that. You can use it to find out if you **really** know your job.

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HOW TO USE THE SOLDIER'S MANUAL

1. To understand how to use your Soldier's Manual, it is first necessary to know a few terms used in your Soldier's Manual. These terms are listed below:

a. **Common Skill Level Task.** A task performed by every soldier in a specified skill level of a specified MOS.

b. **Critical Task.** A task needed to accomplish a mission or do a job and survive on the battlefield.

c. **Duty Position.** The same as job, a major subdivision of skill level. It is further divided into (or composed of) tasks. Thus, MOS 11C may be divided into four skill levels. The four skill levels may be further divided into 10 duty positions (jobs), each of which consists of many tasks.

d. **Duty Position Task.** A task identified with, and related to, a particular duty position (job) at a given skill level within a specified MOS.

e. **GO/NO GO.** This is a pass-fail measure whereby the soldier (student) cannot be partially correct. He either meets the standard or he does not meet the standard.

f. **Job.** The tasks performed by a soldier constitute his job. If identical tasks are performed by several soldiers, they all hold the same job. Job is the same as duty position. An MOS is composed of skill levels, and skill levels are composed of jobs, also called duty positions. Thus, an MOS 11C **soldier** is called a **mortarman** but his job may be **computer** or **radiotelephone operator.**

g. **Military Occupational Specialty (MOS).** A term used to identify a grouping of duty positions having such close relationship that they are interchangeable among soldiers so classified at any skill level.

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HOW TO USE THE SOLDIER'S MANUAL

h. **Performance Measure.** Those steps or behavior that the student or scorer observes to determine if the task is being or has been performed correctly.

i. **Task.** An act or series of acts by an individual to produce a product or achieve a certain result. It is the lowest level of behavior in a job that describes the performance of a meaningful function in a job. A task has an intermediate action that can be specifically stated in terms of behaviorable activities. Tasks vary in complexity. The definition is imprecise and what appears to be a very simple task may be treated more meaningfully as part of a larger task. Conversely, what appears to a complex task may be meaningfully broken into two or more component tasks. A group of tasks go together to form a job or duty position.

j. **Qualification Training.** Introductory training, usually entry level training, given an untrained soldier that results in the soldier performing a specified task to Soldier's Manual standards.

k. **Additional Training.** Refresher or advanced training given to a previously trained soldier that results in the soldier regaining or improving Soldier's Manual task standard proficiency.

l. **Page Color.** The pages in the manual that are used by the skill level 1 soldier are printed on white paper; skill level 2 on yellow; skill level 3 on green; skill level 4 on salmon; and skill level 5 on blue.

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HOW TO USE THE SOLDIER'S MANUAL

COMMON SKILL LEVEL 1 TASKS

2. The Soldier's Manual for Skill Level 1 soldiers (grades E1-E4) contains common combat tasks that **all** 11C10 Infantrymen must be able to perform. These tasks are listed on the Road Map for Skill Level 1 in chapter 1, under "COMMON TASKS FOR ALL SKILL LEVEL 1 INDIRECT FIRE INFANTRYMEN." The Road Map will tell you the page on which each task can be found.

DUTY POSITION TASKS

3. Your duty position may require you to be able to do some add-on tasks. The table below lists the duty positions which require add-on tasks and the number of add-on tasks required. A list of tasks for each duty position and the page on which each task can be found is listed on the Road Map for Skill Level 1 under "DUTY POSITION TASKS."

DUTY POSITION	NUMBER OF TASKS
81-mm Mortar Gunner, Assistant Gunner, Ammo Bearer (Ground-Mounted)	**10**
81-mm Mortar Gunner, Assistant Gunner, Ammo Bearer (Carrier-Mounted)	**10**
4.2-in Mortar Gunner, Assistant Gunner, Ammo Bearer (Ground-Mounted)	**10**
4.2-in Mortar Gunner, Assistant Gunner, Ammo Bearer (Carrier-Mounted)	**10**
Wheeled Vehicle Driver	**18**
Tracked Vehicle Driver	**21**

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TASK SUMMARY

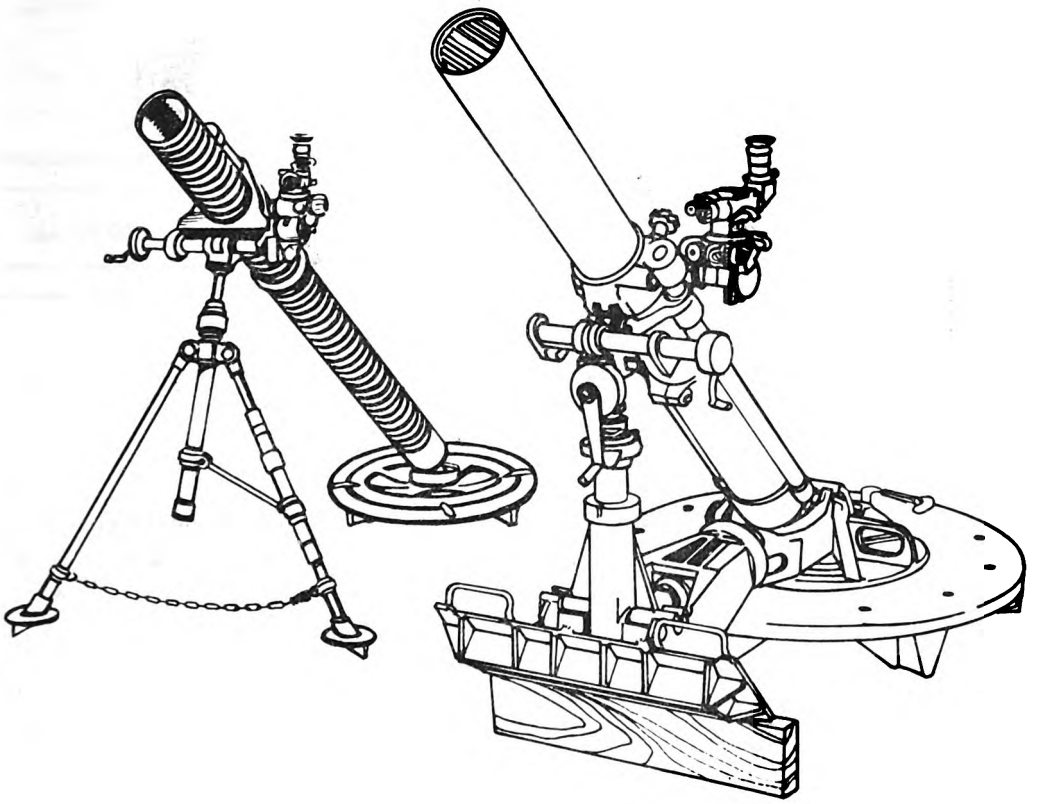
4. For each task in this manual, there **is a task summary which has two parts: a training objective and training guidance.**

a. Training Objective. The training **objective is written in three parts:** TASK, CONDITIONS, and STANDARDS.

(1) The **TASK** states **what you must be able to do.**

TASK

PLACE MORTAR INTO ACTION.



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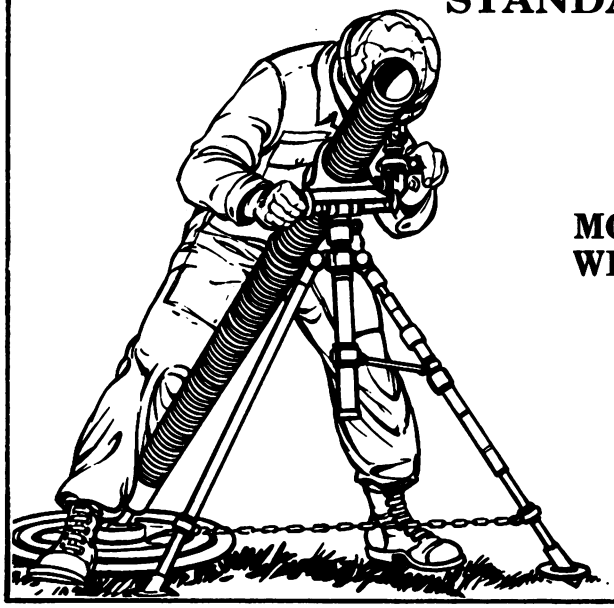
(2) The **CONDITIONS** state the **situation** in which you must be able to do it. All the TASKS in the Soldier's Manual are to be performed in combat uniform, wearing your load-bearing equipment and protective mask, and carrying your assigned weapon, unless the conditions note otherwise.

CONDITIONS

AT THIS POSITION.

(3) The **STANDARD** states **how well** you must be able to do it.

STANDARDS



MOUNT THE MORTAR WITHIN 90 SECONDS.

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EPMS

1. Enlisted personnel have a complete career development system called the **Enlisted Personnel Management System (EPMS).** It will affect the training, evaluation, classification, assignment, and promotion of every enlisted soldier in the Army. The system is designed to provide career incentive, progression, and professionalism, while at the same time providing the right number of qualified people to carry out the Army's missions. There are five skill levels that correspond to a soldier's progression in grade. A Soldier's Manual has been developed for each of the skill levels identified below that contains those critical tasks that the soldier must be able to perform:

Grade	Skill Level	
E-1, 2, 3, & 4	Skill Level 1	} Combined
E-5	Skill Level 2	
E-6	Skill Level 3	
E-7	Skill Level 4	
E-8 & 9	Skill Level 5	

2. Under EPMS, the soldier will be evaluated, then classified, and finally promoted to the next higher grade. This is a significant change from the past when a soldier was first promoted, then classified into a higher skill level, and then evaluated. The Army, in adopting EPMS, assures soldiers better opportunity for attaining and maintaining proficiency through improved training programs – plus providing usable products – Soldier's Manuals, Commander's Manuals, and Job Books – to be used to train and evaluate soldier job performance.

CAREER PROGRESSION UNDER EPMS

HOW TO MAKE SERGEANT E5

The Army will only promote men who have proved that they can do the job. In other words, you must show that you can do the tasks required of a sergeant before you can be considered for promotion to that grade. Here's how the system works:

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1. LEARN THE TASKS IN THIS MANUAL that apply to you. As soon as you have done that, BEGIN LEARNING THE COMMON TASKS FOR SKILL LEVEL 2 in the manual. There will not be as many as you might think since many of the skills that you learned for Skill Level 1 will also be in the Skill Level 2 manual. Use the Skill Level 2 Road Map to determine which common tasks you need to learn.

2. A Skill Qualification Test (SQT) has been developed to replace each MOS test.

a. The goal of each SQT is to provide an equitable, reliable, and relevant means of determining the job proficiency of enlisted soldiers. It covers both the present and the next higher skill levels of the soldier and is numbered to show the next higher skill level. For example, soldiers holding skill level (SL) 1 take SQT 2, which includes critical tasks from SL1 as well as critical tasks from SL2. Under the old "MOS Test" the soldier was likely to be tested on the entire MOS. In the SQT, the soldier is tested only on critical tasks listed in the Soldier's Manual. The SQT sets Army-wide standards for all soldiers in **MOS 11C.**

b. The basic feature of the SQT is that it is task-oriented. The SQT is based upon a thorough job and task analysis which identifies and rigorously defines the critical tasks of an MOS. The SQT samples this domain of critical tasks. All questions and problems in the SQT must bear directly on an individual's ability to perform the specified tasks. For example, an item on the SQT could require soldiers to show that they know how to achieve a correct sight picture for a weapon because that knowledge is required to fire the weapon effectively. **Knowledge of chamber pressure or muzzle velocity is not essential in firing the weapon effectively and will not be tested on the SQT.**

3. As an E4, you will TAKE AN SQT. The SQT will test your ability to do the tasks in the Soldier's Manual. If you make a high enough score on the test, you will be given the Skill Level 2 rating which you must have before you are promoted to E5. Since the SQT will use the same conditions and standards used in the Soldier's Manual, you will be able to prepare in advance for the SQT.

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4. The SQT has three parts: written, hands-on, and performance certification. Sixty to ninety days before the SQT is given, an SQT notice will be sent to each unit. It will tell which tasks will be tested in each part of the SQT. It will also tell how the task will be tested. There are three different ways to test a task. First, you may be asked to answer a **written question** about how a task is performed. You will pick the correct answer from a list of answers and mark the correct answer on a machine-scoreable answer sheet. Second, you may be asked to actually do the task. For example, you may be given an M72A2 LAW and be asked to prepare it for firing. This is called a **hands-on test** which means you are actually required to do the task as you would on the job. Third, your unit commander may observe your performance of a task and report your ability to perform it as part of your SQT score. Your performance on all three parts of the test will be reported to you sometime soon after you complete the SQT. You will be told on which tasks you did not perform well. You can use your Soldier's Manual to improve your performance in those areas.

5. Also while you are an E4, you will ATTEND THE PRIMARY NONCOMMISSIONED OFFICER'S COURSE (**PNCOC**). In this course, you will build on the skills you developed during unit training and gain leadership experience to help you perform more effectively.

6. In addition to the SQT, you will RECEIVE AN ENLISTED EFFICIENCY REPORT (**EER**). In the EER, your supervisor will give his opinion of your performance on the job. Both the SQT and the EER will be used to determine your final evaluation score.

7. If you don't understand parts of the manual or want to know more about advancement opportunities, see your squad leader. Take advantage of his knowledge and experience.

8. At the top of your enlisted chain of command is your sergeant major. He is an expert in helping younger soldiers learn about training, evaluation, and the system for getting ahead in the Army. As such, he is responsible for insuring that your NCOs either provide the assistance you need or refer you to him for his guidance and help.

9. The Army wants and needs well-trained soldiers who desire to advance through the ranks. This manual and the willing assistance of senior NCOs are the tools you can use to your advantage and the Army's.

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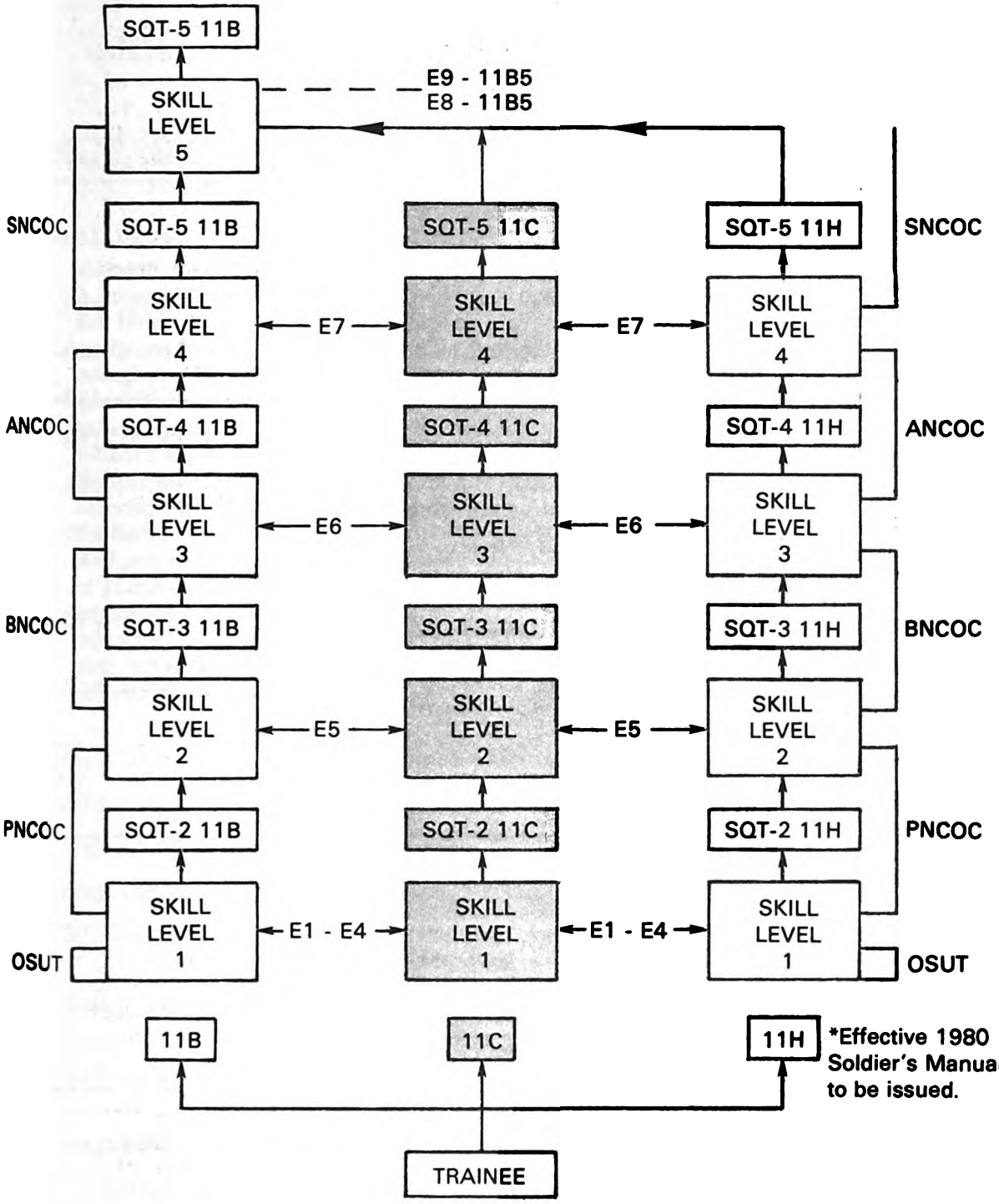
THE INFANTRYMAN'S CAREER PROGRESSION UNDER EPMS



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A NOTE TO TRAINERS

Skills not practiced are soon lost. Football teams have pre-season practice each year to retrain players who have lost skills during the off-season. A football coach plans and conducts practice depending on how well his players can perform basic skills such as blocking, running, and tackling. The same method is used by unit trainers. Your unit training program should be based on how well your soldiers can perform the combat tasks contained in Soldier's Manuals. After you determine the proficiency level of your soldiers, train them in the areas of poor performance first. As a leader and trainer you must be able to perform all tasks required of soldiers in skill levels lower than your own. Using your knowledge and the process described in chapter 3 of **FM 21-6, How to Prepare and Conduct Military Training,** you have to get your team trained to win in combat. Every other year, the soldiers in your unit will be required to take an SQT to evaluate their ability to perform in combat. The evaluation score that the soldier receives on the test will in part determine his eligibility for promotion, reenlistment, schools, and future assignments. Indirectly, this test also measures your success as a trainer in preparing your soldiers for combat.

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ROAD MAP
FOR
INDIRECT FIRE INFANTRYMAN SKILL LEVEL 1
COMMON TASKS FOR ALL SKILL LEVEL 1 INDIRECT FIRE INFANTRYMEN

BATTLEFIELD SURVIVAL

TASK NUMBER	FIRST AID	PAGE
	Introduction to first aid.	2-I-A-1.1
081-831-1004	Perform mouth-to-mouth resuscitation and external heart massage.	2-I-A-2.1
081-831-1005	Stop bleeding (arm or leg).	2-I-A-3.1
081-831-1006	Identify signs of and treat for shock.	2-I-A-4.1
081-831-1007	Splint a fracture.	2-I-A-5.1
081-831-1008	Apply first aid measures for burns.	2-I-A-6.1
081-831-1010	Apply first aid for sun or heat injuries.	2-I-A-7.1
081-831-1011	Apply first aid for wet or cold injuries.	2-I-A-8.1
	NUCLEAR, BIOLOGICAL, AND CHEMICAL	
092-503-1001	Perform operator's maintenance on an M17 series protective mask.	2-I-B-1.1
092-503-1010	Exchange filters on an M17 series protective mask.	2-I-B-2.1
092-503-1002	Put on and wear a protective mask.	2-I-B-3.1
092-503-1015	Put on and wear protective clothing.	2-I-B-4.1
092-503-1007	Decontaminate self.	2-I-B-5.1
092-503-1008	Decontaminate individual equipment.	2-I-B-6.1
092-503-1014	Identify a chemical agent using ABC-M8 detector paper.	2-I-B-7.1
092-503-1006	Demonstrate visual, vocal, and sound alarms for an NBC attack.	2-I-B-8.1
092-503-1009	Satisfy personal needs in a chemical environment.	2-I-B-9.1
092-503-1005	Protect self against a nuclear hazard.	2-I-B-10.1

ALL TASKS MARKED WITH (RC) APPLY ONLY TO THE US ARMY RESERVE AND NATIONAL GUARD.

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(NUCLEAR, BIOLOGICAL, AND CHEMICAL, CONTINUED)

TASK NUMBER		PAGE
081-831-1012	Administer antidote to a nerve-agent casualty.	2-I-B-11.1
081-831-1017	Administer antidote to blood-agent casualty.	2-I-B-12.1
081-831-1009	Apply artificial respiration to a chemical-agent casualty.	2-I-B-13.1
092-503-1004	Recognize and protect self against a chemical/biological (CB) hazard.	2-I-B-14.1
	INDIVIDUAL FITNESS	
071-327-0201	Maintain an appropriate level of physical fitness (male only).	2-I-C-1.1
	COMBAT TECHNIQUES	
	CAMOUFLAGE, COVER, AND CONCEALMENT	
051-202-1001	Camouflage/conceal self and individual equipment.	2-II-A-1.1
051-202-1002	Camouflage/conceal equipment.	2-II-A-2.1
051-202-1003	Camouflage/conceal defensive positions.	2-II-A-3.1
071-331-0852	Clear fields of fire.	2-II-A-4.1
	BASIC INDIVIDUAL TECHNIQUES	
071-321-0505	Move as a member of a dismounted mortar squad (81-mm mortar).	2-II-B-1.1
071-326-0502	Move under direct fire.	2-II-B-2.1
071-326-0510	React to indirect fire.	2-II-B-3.1
071-326-0511	React to flares.	2-II-B-4.1
071-326-0503	Move over, through, or around obstacles.	2-II-B-5.1
071-326-0512	Estimate range.	2-II-B-6.1
071-326-0513	Select temporary battlefield positions.	2-II-B-7.1
071-326-5703	Construct individual fighting position.	2-II-B-8.1
071-326-0600	Use visual signals to control movement (dismounted).	2-II-B-9.1
071-326-0514	Construct a mortar position (81-mm, 107-mm (4.2-in)).	2-II-B-10.1

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TASK NUMBER	SECURITY AND INTELLIGENCE	PAGE
071-331-0801	Use challenge and password.	2-II-C-1.1
071-331-0802	Process known or suspected enemy personnel.	2-II-C-2.1
071-331-0803	Collect/report information - SALUTE.	2-II-C-3.1
071-331-0804	Conduct day and night surveillance without the aid of electronic devices.	2-II-C-4.1
071-331-0805	Engage enemy armor weak points.	2-II-C-5.1
071-331-0806	Identify opposing force (OPFOR) armored vehicles.	2-II-C-6.1
071-331-0808	Identify opposing force (OPFOR) weapons and equipment.	2-II-C-7.1
	LAND NAVIGATION	
	Introduction to land navigation.	2-II-D.1
071-329-1001	Identify terrain features (natural and man-made) on the map.	2-II-D-1.1
071-329-1002	Determine the grid coordinates of a point on a military map using the military grid reference system.	2-II-D-2.1
071-329-1010	Determine azimuths using a coordinate scale and protractor.	2-II-D-3.1
071-329-1009	Convert azimuths (magnetic or grid).	2-II-D-4.1
071-329-1003	Determine a magnetic azimuth using a compass.	2-II-D-5.1
071-329-1018	Determine direction using field expedient methods.	2-II-D-6.1
071-329-1016	Determine an azimuth using an M2 compass.	2-II-D-7.1
	WEAPONS	
	M16A1 RIFLE	
	Introduction -- M16A1 Rifle.	2-III-A.1
071-311-2001	Perform operator maintenance on an M16A1 rifle, magazine, and ammunition.	2-III-A-1.1
071-311-2003	Load, reduce a stoppage, and clear an M16A1 rifle.	2-III-A-2.1
071-311-2004	Battlesight zero an M16A1 rifle.	2-III-A-3.1

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TASK NUMBER	(M16A1, CONTINUED)	PAGE
071-311-2007	Qualify with the M16A1 rifle.	2-III-A-4.1
071-311-2006	Use limited visibility firing techniques with the M16A1 rifle.	2-III-A-5.1
	M203 GRENADE LAUNCHER	
071-311-2101	Perform operator maintenance on M203 grenade launcher and ammunition.	2-III-B-1.1
071-311-2102	Load, unload, and clear the M203 grenade launcher.	2-III-B-2.1
071-311-2103	Zero an M203 grenade launcher.	2-III-B-3.1
071-311-2104	Engage targets with an M203 grenade launcher and apply immediate action to reduce a stoppage.	2-III-B-4.1
071-311-2105	Use limited visibility firing technique with the M203 grenade launcher.	2-III-B-5.1
	LIGHT ANTITANK WEAPON (LAW)	
071-318-2201	Prepare an M72A2 LAW for firing; restore M72A2 LAW to carrying configuration.	2-III-C-1.1
071-318-2202	Engage targets with an M72A2 LAW.	2-III-C-2.1
071-318-2203	Apply immediate action to correct a malfunction on an M72A2 LAW.	2-III-C-3.1
	CALIBER .45 PISTOL	
191-376-0105	Maintain a caliber .45 pistol.	2-III-D-1.1
191-376-0104	Engage targets with a caliber .45 pistol.	2-III-D-2.1
	.50 CALIBER MACHINEGUN (MECHANIZED UNITS ONLY)	
071-313-3451	Perform operator maintenance on a caliber .50 M2 HB machinegun and ammunition.	2-III-E-1.1
071-313-3452	Target/zero a caliber .50 machinegun.	2-III-E-2.1
071-313-3453	Load, reduce a stoppage, unload, and clear a caliber .50 machinegun.	2-III-E-3.1
071-313-3454	Engage targets with a caliber .50 machinegun.	2-III-E-4.1
071-313-3455	Set headspace and timing on a caliber .50 machinegun.	2-III-E-5.1

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TASK NUMBER	HAND GRENADES	PAGE
071-325-4401	Perform safety checks on hand grenades.	2-III-F-1.1
071-325-4402	Engage enemy targets with hand grenades.	2-III-F-2.1
071-325-4405	Identify and employ hand grenades.	2-III-F-3.1
	MINES	
051-192-1502	Install and fire/recover an M18A1 claymore mine.	2-III-G-1.1
051-192-1021	Locate mines by visual means.	2-III-G-2.1
051-192-1022	Locate mines by probing.	2-III-G-3.1
051-192-1501	Neutralize enemy mines.	2-III-G-4.1
	FORWARD OBSERVER PROCEDURES	
061-283-6002	Locate a target by shift from a known point.	2-IV-A-1.1
061-283-6003	Call for/adjust indirect fire.	2-IV-A-2.1
	COMMUNICATIONS	
113-600-3001	Perform operator preventive maintenance on telephone set (TA-312/PT or TA-1/PT).	2-VI-A-1.1
113-600-1001	Install telephone set (TA-312/PT or TA-1/PT).	2-VI-A-2.1
113-587-3005	Perform operator maintenance on radio sets; AN/PRC-77 or AN/VRC-64.	2-VI-A-3.1
113-587-2001	Operate radio set AN/PRC-77 or AN/PRC-25.	2-VI-A-4.1
113-587-2002	Prepare radio set AN/VRC-64 for operation.	2-VI-A-5.1
113-587-3004	Perform operator maintenance on radio set AN/VRC-46 or AN/VRC-47.	2-VI-A-6.1
113-587-2020	Prepare tactical FM radios (AN/VRC-46 or AN/VRC-47) for operation.	2-VI-A-7.1
113-573-8001	Use an automated CEOI.	2-VI-A-8.1
113-571-2001	Use KAL-61B 1400 numerical code to authenticate transmissions and encrypt/decrypt numbers and grid zone letters.	2-VI-A-9.1
113-571-2002	Encode and decode messages using a KTC-600 tactical operations code.	2-VI-A-10.1
113-571-1003	Establish and enter or leave a radio net.	2-VI-A-11.1

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TASK NUMBER	(COMMUNICATIONS, CONTINUED)	PAGE
113-571-1001	Transmit and receive a radio message.	2-VI-A-12.1
113-594-2005	Prepare/operate switchboard SB-993 (81-mm mortar only).	2-VI-A-13.1
113-594-2004	Prepare manual telephone switchboard SB-22/PT or SB-22A/PT for operation (107-mm mortar only).	2-VI-A-14.1
	FIRE WITHOUT AN FDC	
071-321-4050	Engage a target using fire without an FDC (direct lay and direct alinement).	2-VIII-F-1.1
	DUTY POSITION TASKS - SKILL LEVEL 1	
	81-MM MORTAR CREWMAN (GROUND-MOUNTED)	
071-321-3901	Place a ground-mounted 81-mm mortar into action.	2-VIII-A-1.1
071-321-3902	Boresight 81-mm mortar.	2-VIII-A-2.1
071-321-3903	Perform safety checks on 81-mm mortar (ground- or carrier-mounted).	2-VIII-A-3.1
071-321-3904	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	2-VIII-A-4.1
071-321-3905	Prepare 81-mm mortar ammunition for firing.	2-VIII-A-5.1
071-321-3906	Perform operator maintenance on 81-mm mortar and associated fire control equipment.	2-VIII-A-6.1
071-321-3907	Remove a misfire from the 81-mm mortar (ground-mounted).	2-VIII-A-7.1
071-321-3909	Refer sight and realine aiming posts.	2-VIII-A-8.1
071-321-3910	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	2-VIII-A-9.1
071-321-3911	Manipulate mortar for traversing and searching fires.	2-VIII-A-10
	81-MM MORTAR CREWMAN (CARRIER-MOUNTED)	
071-321-3912	Place a carrier-mounted 81-mm mortar into action.	2-VIII-B-1.1
071-321-3917	Remove a misfire from the 81-mm mortar (carrier-mounted).	2-VIII-B-2.1

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(81-MM MORTAR CREWMAN (CARRIER-MOUNTED), CONTINUED)

TASK NUMBER		PAGE
071-321-3902	Boresight 81-mm mortar.	2-VIII-A-2.1
071-321-3903	Perform safety checks on 81-mm mortar (ground- or carrier-mounted).	2-VIII-A-3.1
071-321-3904	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	2-VIII-A-4.1
071-321-3905	Prepare 81-mm mortar ammunition for firing.	2-VIII-A-5.1
071-321-3906	Perform operator maintenance on 81-mm mortar and associated fire control equipment.	2-VIII-A-6.1
071-321-3909	Refer sight and realine aiming posts.	2-VIII-A-8.1
071-321-3910	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	2-VIII-A-9.1
071-321-3911	Manipulate mortar for traversing and searching fires.	2-VIII-A-10.1

107-MM (4.2-IN) MORTAR CREWMAN (GROUND-MOUNTED)

071-322-4201	Ground mount 107-mm (4.2-in) mortar.	2-VIII-C-1.1
071-322-4202	Boresight 107-mm (4.2-in) mortar.	2-VIII-C-2.1
071-322-4203	Perform safety checks on 107-mm (4.2-in) mortar (ground- and carrier-mounted).	2-VIII-C-3.1
071-322-4204	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	2-VIII-C-4.1
071-322-4205	Prepare 107-mm (4.2-in) mortar ammunition for firing.	2-VIII-C-5.1
071-322-4206	Perform operator maintenance on 107-mm (4.2-in) mortar and equipment.	2-VIII-C-6.1
071-322-4207	Remove a misfire from the 107-mm (4.2-in) mortar (ground-mounted).	2-VIII-C-7.1
071-322-4208	Refer sight and realine aiming posts.	2-VIII-C-8.1
071-322-4209	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	2-VIII-C-9.1
071-322-4210	Manipulate mortar for traversing fire (ground- or carrier-mounted).	2-VIII-C-10.1

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107-MM (4.2-IN) MORTAR CREWMAN (CARRIER-MOUNTED)

TASK NUMBER		PAGE
071-322-4212	Place carrier-mounted 107-mm mortar into action.	2-VIII-D-1.1
071-322-4216	Remove a misfire from the 107-mm mortar (carrier-mounted).	2-VIII-D-2.1
071-322-4202	Boresight 107-mm (4.2-in) mortar.	2-VIII-C-2.1
071-322-4203	Perform safety checks on 107-mm (4.2-in) mortar (ground- and carrier-mounted).	2-VIII-C-3.1
071-322-4204	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	2-VIII-C-4.1
071-322-4205	Prepare 107-mm (4.2-in) mortar ammunition for firing.	2-VIII-C-5.1
071-322-4206	Perform operator maintenance on 107-mm (4.2-in) mortar and equipment.	2-VIII-C-6.1
071-322-4208	Refer sight and realine aiming posts.	2-VIII-C-8.1
071-322-4209	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	2-VIII-C-9.1
071-322-4210	Manipulate mortar for traversing fire (ground- or carrier-mounted).	2-VIII-C-10.1

WHEELED VEHICLE DRIVER (MORTAR, GROUND-MOUNTED)

071-333-6001	Drive a wheeled vehicle cross-country.	2-VII-A-1.1
071-333-6002	Drive a wheeled vehicle on roads, in vehicle parks, and in built-up areas.	2-VII-A-2.1
071-333-6003	Drive a wheeled vehicle using blackout drive.	2-VII-A-3.1
071-333-6004	Start a wheeled-vehicle engine using auxiliary power (M151, M715, and M561).	2-VII-A-4.1
071-333-6005	Perform an ESC (equipment serviceability criteria) inspection on a wheeled vehicle (M151, M715, and M561).	2-VII-A-5.1
071-333-6006	Maintain required TAMMS records on a wheeled vehicle (M151, M715, and M561).	2-VII-A-6.1
071-333-6007	Perform operator maintenance on a wheeled vehicle.	2-VII-A-7.1

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(WHEELED VEHICLE DRIVER (MORTAR, GROUND-MOUNTED), CONTINUED)

TASK NUMBER		PAGE
071-333-6008	Recover a wheeled vehicle. NOTE: Wheeled vehicle drivers will also be responsible for the mortar gunnery tasks that correspond to the type platoon assigned.	2-VII-A-8.1
TRACKED VEHICLE DRIVER (MORTAR, CARRIER-MOUNTED)		
071-333-6501	Drive an APC cross-country.	2-VII-B-1.1
071-333-6502	Drive an APC on roads, in vehicle parks, and in built-up areas.	2-VII-B-2.1
071-333-6503	Drive an APC with night vision devices, infrared equipment, and blackout drive.	2-VII-B-3.1
071-333-6504	Operate an APC in water.	2-VII-B-4.1
071-333-6505	Start the APC engine using auxiliary power.	2-VII-B-5.1
071-333-6506	Perform a tracked-vehicle ESC (equipment serviceability criteria) inspection.	2-VII-B-6.1
071-333-6507	Maintain required TAMMS records on a tracked vehicle.	2-VII-B-7.1
071-333-6508	Perform operator maintenance on an APC.	2-VII-B-8.1
071-333-6509	Recover a tracked vehicle using field expedients.	2-VII-B-9.1
071-333-6510	*Maintain auxiliary generator on M577 tracked vehicle.	2-VII-B-10.1
071-333-6511	*Install/operate auxiliary generator on M577 tracked vehicle. *M577 drivers only. NOTE: Tracked vehicle drivers will also be responsible for the mortar gunnery tasks that correspond to the type platoon assigned.	2-VII-B-11.1
Appendix A	Consolidated List of References	A-1
Questionnaire		Q-1
Re-order Form		

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HOW TO USE THE SOLDIER'S MANUAL FOR SKILL LEVEL 2

Refer to the introduction to Skill Level 1, pages 1-I-A-1 thru 1-I-A-5, for an explanation of what is a Soldier's Manual. Refer to pages 1-I-A-7 thru 1-I-A-9 for an explanation of a task summary.

COMMON SKILL LEVEL 2 TASKS

The Soldier's Manual for Skill Level 2 soldiers (grade E5) contains basic combat tasks that all 11C20 Indirect Fire Infantrymen must be able to perform. These are listed on the Road Map for Skill Level 2 in chapter 1, under "COMMON TASKS FOR ALL SKILL LEVEL 2 INDIRECT FIRE INFANTRYMEN." The Road Map will tell you the page on which each task can be found.

DUTY POSITION TASKS

Your duty position may require you to be able to do some add-on tasks. The table below lists the duty positions which require add-on tasks and the number of add-on tasks required. A list of tasks for each duty position and the page on which each task can be found are listed on the Road Map for Skill Level 2 under "DUTY POSITION TASKS."

DUTY POSITION	NUMBER OF TASKS
81-mm Mortar Squad Leader (Infantry, Mech)	16
107-mm Mortar Squad Leader (Infantry, Mech)	13
Computer (81-mm)	10
Computer (107-mm)	9

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HOW TO MAKE SERGEANT E6

The Army will only promote men who have proved that they can do the job. In other words, you must show that you can do the tasks required of a staff sergeant before you can be considered for promotion to that grade. Here is how the system works:

1. LEARN THE TASKS IN THIS MANUAL that apply to you. As soon as you have done that, ask for a copy of the 11C30 Soldier's Manual **(for Skill Level 3).**

2. Then LEARN THE COMMON TASKS IN THE SKILL LEVEL 3 MANUAL. There will not be as many as you might think since many of the skills that you learned for Skill Level 2 will also be in the Skill Level 3 manual.

3. As an E5, you will TAKE A SKILL QUALIFICATION TEST (SQT). The SQT will test your ability to do the tasks in the Soldier's Manual. If you pass the test, you will be given the Skill Level 3 rating which you must have before you are promoted to E6. Since the SQT will use the same conditions and standards used in the Soldier's Manual, you will be able to prepare in advance for the SQT.

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4. The SQT has three parts: written, hands-on, and performance certification. Sixty to ninety days before the SQT is given, an SQT notice will be sent to each unit. It will tell which tasks will be tested in each part of the SQT. It will also tell how the task will be tested. There are three different ways to test a task. First, you may be asked to answer a **written question** about how a task is performed. You will pick the correct answer from a list of answers and mark the correct answer on a machine-scoreable answer sheet. Second, you may be asked to actually do the task. For example, you may be given an M72A2 LAW and be asked to prepare it for firing. This is called a **hands-on test** which means you are actually required to do the task as you would on the job. Third, your unit commander may observe your performance of a task and report your ability to perform it as part of your SQT score. Your performance on all three parts of the test will be reported to you sometime after you complete the SQT. You will be told which tasks you did not perform well. You can use your Soldier's Manual to improve your performance in those areas.

5. Also while you are an E5, you will ATTEND THE BASIC NONCOMMISSIONED OFFICER'S COURSE (**BNCOC**). In this course, you will build on the skills you developed during unit training and gain leadership experience to help you perform more effectively.

6. In addition to the SQT, you will RECEIVE AN ENLISTED EFFICIENCY REPORT (**EER**). In the EER, your supervisor will give his opinion of your performance on the job. Both the SQT and the EER will be used to determine your final evaluation score.

7. If you don't understand any parts of the manual or want to know more about advancement opportunities, see your squad leader. Take advantage of his knowledge and experience.

8. At the top of your enlisted chain of command is your sergeant major. He is an expert in helping younger soldiers learn about training, evaluation, and the system for getting ahead in the Army. As such, he is responsible for insuring that your NCOs either provide the assistance you need or refer you to him for his guidance and help.

9. The Army wants and needs well-trained soldiers who desire to advance through the ranks. This manual and the willing assistance of senior NCOs are the tools you can use to your advantage and the Army's.

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ROAD MAP
FOR
INDIRECT FIRE INFANTRYMAN SKILL LEVEL 2

COMMON TASKS FOR ALL SKILL LEVEL 2 INDIRECT FIRE INFANTRYMEN

NOTE:

1. TASKS MARKED (SL 1) WERE SKILL LEVEL 1 SOLDIERS' TASKS AND ARE NOW YOUR RESPONSIBILITY.

2. TASKS MARKED IN THIS MANNER ARE YOUR NEW SKILL LEVEL 2 TASKS.

BATTLEFIELD SURVIVAL

FIRST AID

TASK NUMBER		SL	PAGE
	Introduction to first aid.	1	2-I-A-1.1
081-831-1004	Perform mouth-to-mouth resuscitation and external heart massage.	1	2-I-A-2.1
081-831-1005	Stop bleeding (arm or leg).	1	2-I-A-3.1
081-831-1006	Identify signs of and treat for shock.	1	2-I-A-4.1
081-831-1007	Splint a fracture.	1	2-I-A-5.1
081-831-1008	Apply first aid measures for burns.	1	2-I-A-6.1
081-831-1010	Apply first aid for sun or heat injuries.	1	2-I-A-7.1
081-831-1011	Apply first aid for wet or cold injuries.	1	2-I-A-8.1

NUCLEAR, BIOLOGICAL, AND CHEMICAL

092-503-1001	Perform operator's maintenance on an M17 series protective mask.	1	2-I-B-1.1
092-503-1010	Exchange filters on an M17 series protective mask.	1	2-I-B-2.1
092-503-1002	Put on and wear a protective mask.	1	2-I-B-3.1
092-503-1015	Put on and wear protective clothing.	1	2-I-B-4.1
092-503-1007	Decontaminate self.	1	2-I-B-5.1
092-503-1008	Decontaminate individual equipment.	1	2-I-B-6.1

ALL TASKS MARKED WITH (RC) APPLY ONLY TO THE US ARMY RESERVE AND NATIONAL GUARD.

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(NUCLEAR, BIOLOGICAL, AND CHEMICAL, (CONTINUED))

TASK NUMBER		SL	PAGE
092-503-1014	Identify a chemical agent using ABC-M8 detector paper.	1	2-I-B-7.1
092-503-1006	Demonstrate visual, vocal, and sound alarms for an NBC attack.	1	2-I-B-8.1
092-503-1009	Satisfy personal needs in a chemical environment.	1	2-I-B-9.1
092-503-1005	Protect self against a nuclear hazard.	1	2-I-B-10.1
081-831-1012	Administer antidote to a nerve-agent casualty.	1	2-I-B-11.1
081-831-1017	Administer antidote to blood-agent casualty.	1	2-I-B-12.1
081-831-1009	Apply artificial respiration to a chemical-agent casualty.	1	2-I-B-13.1
092-503-1004	Recognize and protect self against a chemical/biological (CB) hazard.	1	2-I-B-14.1
092-503-2002	Decontaminate equipment using an ABC-M11 decontamination apparatus.	2	2-I-B-15.1
092-503-2007	Ignite smoke pots.	2	2-I-B-16.1
092-503-2001	Read and report radiation dosages.	2	2-I-B-17.1
	INDIVIDUAL FITNESS		
071-327-0201	Maintain an appropriate level of physical fitness (male only).	1	2-I-C-1.1
	COMBAT TECHNIQUES		
	CAMOUFLAGE, COVER, AND CONCEALMENT		
051-202-1001	Camouflage/conceal self and individual equipment.	1	2-II-A-1.1
051-202-1002	Camouflage/conceal equipment.	1	2-II-A-2.1
051-202-1003	Camouflage/conceal defensive positions.	1	2-II-A-3.1
071-331-0852	Clear fields of fire.	1	2-II-A-4.1
	BASIC INDIVIDUAL TECHNIQUES		
071-321-0505	Move as a member of a dismounted mortar squad (81-mm mortar).	1	2-II-B-1.1
071-326-0502	Move under direct fire.	1	2-II-B-2.1
071-326-0510	React to indirect fire.	1	2-II-B-3.1

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(BASIC INDIVIDUAL TECHNIQUES, CONTINUED)

TASK NUMBER		SL	PAGE
071-326-0511	React to flares.	1	2-II-B-4.1
071-326-0503	Move over, through, or around obstacles.	1	2-II-B-5.1
071-326-0512	Estimate range.	1	2-II-B-6.1
071-326-0513	Select temporary battlefield positions.	1	2-II-B-7.1
071-326-5703	Construct individual fighting position.	1	2-II-B-8.1
071-326-0600	Use visual signals to control movement (dismounted).	1	2-II-B-9.1
071-326-0514	Construct a mortar position (81-mm, 107-mm (4.2-in)).	1	2-II-B-10.1
071-326-5704	Supervise/evaluate construction of a fighting position.	2	2-II-B-11.1

SECURITY AND INTELLIGENCE

071-331-0801	Use challenge and password.	1	2-II-C-1.1
071-331-0802	Process known or suspected enemy personnel.	1	2-II-C-2.1
071-331-0803	Collect/report information - SALUTE.	1	2-II-C-3.1
071-331-0804	Conduct day and night surveillance without the aid of electronic devices.	1	2-II-C-4.1
071-331-0805	Engage enemy armor weak points.	1	2-II-C-5.1
071-331-0806	Identify opposing force (OPFOR) armored vehicles.	1	2-II-C-6.1
071-331-0808	Identify opposing forces (OPFOR) weapons and equipment.	1	2-II-C-7.1
071-331-0807	Enforce noise, light, and litter discipline.	2	2-II-C-8.1
071-331-0809	Emplace and recover field expedient warning devices.	2	2-II-C-9.1
071-331-0810	Emplace/recover pyrotechnic early warning devices.	2	2-II-C-10.1
071-331-0811	Emplace/recover electronic anti-intrusion devices.	2	2-II-C-11.1

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LAND NAVIGATION

TASK NUMBER		SL	PAGE
	Introduction to land navigation.		2-II-D.1
071-329-1001	Identify terrain features (natural and man-made) on the map.	1	2-II-D-1.1
071-329-1002	Determine the grid coordinates of a point on a military map using the military grid reference system.	1	2-II-D-2.1
071-329-1010	Determine azimuths using a coordinate scale and protractor.	1	2-II-D-3.1
071-329-1009	Convert azimuths (magnetic or grid).	1	2-II-D-4.1
071-329-1003	Determine a magnetic azimuth using a compass.	1	2-II-D-5.1
071-329-1018	Determine direction using field expedient methods.	1	2-II-D-6.1
071-329-1016	Determine an azimuth using an M2 compass.	1	2-II-D-7.1
071-329-1006	Navigate from one position on the ground to another point.	2	2-II-D-8.1
071-329-1007	Determine distance while moving between two points on the ground.	2	2-II-D-9.1
071-329-1008	Measure distance on a map.	2	2-II-D-10.1
071-329-1004	Determine the elevation of a point on the ground using a map.	2	2-II-D-11.1
071-329-1011	Orient a map using a compass.	2	2-II-D-12.1
071-329-1005	Determine a location on the ground by terrain association.	2	2-II-D-13.1
071-329-1012	Orient a map to the ground by map-terrain association.	2	2-II-D-14.1

WEAPONS

M16A1 RIFLE

	Introduction -- M16A1 Rifle.		2-III-A.1
071-311-2001	Perform operator maintenance on an M16A1 rifle, magazine, and ammunition.	1	2-III-A-1.1
071-311-2003	Load, reduce a stoppage, and clear an M16A1 rifle.	1	2-III-A-2.1
071-311-2004	Battlesight zero an M16A1 rifle.	1	2-III-A-3.1

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(M16A1 RIFLE, CONTINUED)

TASK NUMBER		SL	PAGE
071-311-2007	Qualify with the M16A1 rifle.	1	2-III-A-4.1
071-311-2006	Use limited visibility firing techniques with the M16A1 rifle.	1	2-III-A-5.1

M203 GRENADE LAUNCHER

071-311-2101	Perform operator maintenance on M203 grenade launcher and ammunition.	1	2-III-B-1.1
071-311-2102	Load, unload, and clear the M203 grenade launcher.	1	2-III-B-2.1
071-311-2103	Zero an M203 grenade launcher.	1	2-III-B-3.1
071-311-2104	Engage targets with an M203 grenade launcher and apply immediate action to reduce a stoppage.	1	2-III-B-4.1
071-311-2105	Use limited visibility firing technique with the M203 grenade launcher.	1	2-III-B-5.1

LIGHT ANTITANK WEAPON (LAW)

071-318-2201	Prepare an M72A2 LAW for firing; restore M72A2 LAW to carrying configuration.	1	2-III-C-1.1
071-318-2202	Engage targets with an M72A2 LAW.	1	2-III-C-2.1
071-318-2203	Apply immediate action to correct a malfunction on an M72A2 LAW.	1	2-III-C-3.1

CALIBER .45 PISTOL

191-376-0105	Maintain a caliber .45 pistol.	1	2-III-D-1.1
191-376-0104	Engage targets with a caliber .45 pistol.	1	2-III-D-2.1

.50 CALIBER MACHINEGUN (MECHANIZED UNITS ONLY)

71-313-3451	Perform operator maintenance on a caliber .50 M2 HB machinegun and ammunition.	1	2-III-E-1.1
71-313-3452	Target/zero a caliber .50 machinegun.	1	2-III-E-2.1
71-313-3453	Load, reduce a stoppage, unload, and clear a caliber .50 machinegun.	1	2-III-E-3.1

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(.50 CALIBER MACHINEGUN (MECHANIZED UNITS ONLY), CONTINUED)

TASK NUMBER		SL	PAGE
071-313-3454	Engage targets with a caliber .50 machinegun.	1	2-III-E-4.1
071-313-3455	Set headspace and timing on a caliber .50 machinegun.	1	2-III-E-5.1
	HAND GRENADES		
071-325-4401	Perform safety checks on hand grenades.	1	2-III-F-1.1
071-325-4402	Engage enemy targets with hand grenades.	1	2-III-F-2.1
071-325-4405	Identify and employ hand grenades.	1	2-III-F-3.1
	MINES		
051-192-1502	Install and fire/recover an M18A1 claymore mine.	1	2-III-G-1.1
051-192-1021	Locate mines by visual means.	1	2-III-G-2.1
051-192-1022	Locate mines by probing.	1	2-III-G-3.1
051-192-1501	Neutralize enemy mines.	1	2-III-G-4.1
	DEMOLITIONS		
051-193-1503	Construct a nonelectric (initiation) detonating assembly.	2	2-III-H-1.1
051-193-1003	Prime a demolition block nonelectrically.	2	2-III-H-2.1
051-193-1004	Construct an electric (initiation) detonating assembly.	2	2-III-H-3.1
051-193-1005	Prime demolition block electrically.	2	2-III-H-4.1
051-193-1006	Connect electrical firing circuits.	2	2-III-H-5.1
051-193-1502	Clear demolition misfires (above ground).	2	2-III-H-6.1
	FORWARD OBSERVER PROCEDURES		
061-283-6002	Locate a target by shift from a known point.	1	2-IV-A-1.1
061-283-6003	Call for/adjust indirect fire.	1	2-IV-A-2.1
061-283-6004	Locate a target by polar plot.	2	2-IV-A-3.1
071-329-1021	Determine an enemy target location using grid coordinates.	2	2-IV-A-4.1

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COMPUTING

M16 PLOTTING BOARD

TASK NUMBER		SL	PAGE
	Introduction to M16 Plotting Board.		2-V-A.1
071-321-1601	Prepare M16 plotting board for operation as an observed chart and determine initial firing data for mortars (pivot point).	2	2-V-A-1.1
071-321-1602	Process subsequent FO corrections using M16 plotting board (pivot point).	2	2-V-A-2.1

COMMUNICATIONS

113-600-3001	Perform operator preventive maintenance on telephone set (TA-312/PT or TA-1/PT).	1	2-VI-A-1.1
113-600-1001	Install telephone set (TA-312/PT or TA-1/PT).	1	2-VI-A-2.1
113-587-3005	Perform operator maintenance on radio sets; AN/PRC-77 or AN/VRC-64.	1	2-VI-A-3.1
113-587-2001	Operate radio set AN/PRC-77 or AN/PRC-25.	1	2-VI-A-4.1
113-587-2002	Prepare radio set AN/VRC-64 for operation.	1	2-VI-A-5.1
113-587-3004	Perform operator maintenance on radio set AN/VRC-46 or AN/VRC-47.	1	2-VI-A-6.1
113-587-2020	Prepare tactical FM radios (AN/VRC-46 or AN/VRC-47) for operation.	1	2-VI-A-7.1
113-573-8001	Use an automated CEOI.	1	2-VI-A-8.1
113-571-2001	Use KAL-61B 1400 numerical code to authenticate transmissions and encrypt/decrypt numbers and grid zone letters.	1	2-VI-A-9.1
113-571-2002	Encode and decode messages using a KTC-600 tactical operations code.	1	2-VI-A-10.1
113-571-1003	Establish and enter or leave a radio net.	1	2-VI-A-11.1
113-571-1001	Transmit and receive a radio message.	1	2-VI-A-12.1
113-594-2005	Prepare/operate switchboard SB-993 (81-mm mortar only).	1	2-VI-A-13.1
113-594-2004	Prepare manual telephone switchboard SB-22/PT or SB-22A/PT for operation (107-mm mortar only).	1	2-VI-A-14.1

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WHEELED VEHICLES (MORTAR, GROUND-MOUNTED)

TASK NUMBER		SL	PAGE
071-333-6001	Drive a wheeled vehicle cross-country.	1	2-VII-A-1.1
071-333-6002	Drive a wheeled vehicle on roads, in vehicle parks, and in built-up areas.	1	2-VII-A-2.1
071-333-6003	Drive a wheeled vehicle using blackout drive.	1	2-VII-A-3.1
071-333-6004	Start a wheeled-vehicle engine using auxiliary power (M151, M715, and M561).	1	2-VII-A-4.1
071-333-6005	Perform an ESC (equipment serviceability criteria) inspection on a wheeled vehicle (M151, M715, and M561).	1	2-VII-A-5.1
071-333-6006	Maintain required TAMMS records on a wheeled vehicle (M151, M715, and M561).	1	2-VII-A-6.1
071-333-6007	Perform operator maintenance on a wheeled vehicle.	1	2-VII-A-7.1
071-333-6008	Recover a wheeled vehicle.	1	2-VII-A-8.1

TRACKED VEHICLES (MORTAR, CARRIER-MOUNTED)

071-333-6501	Drive an APC cross-country.	1	2-VII-B-1.
071-333-6502	Drive an APC on roads, in vehicle parks, and in built-up areas.	1	2-VII-B-2.
071-333-6503	Drive an APC with night vision devices, infrared equipment, and blackout drive.	1	2-VII-B-3.
071-333-6504	Operate an APC in water.	1	2-VII-B-4
071-333-6505	Start the APC engine using auxiliary power.	1	2-VII-B-5
071-333-6506	Perform a tracked-vehicle ESC (equipment serviceability criteria) inspection.	1	2-VII-B-6
071-333-6507	Maintain required TAMMS records on a tracked vehicle.	1	2-VII-B-7
071-333-6508	Perform operator maintenance on an APC.	1	2-VII-B-8
071-333-6509	Recover a tracked vehicle using field expedients.	1	2-VII-B-9
071-333-6510	*Maintain auxiliary generator on M577 tracked vehicle.	1	2-VII-B-1

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(TRACKED VEHICLE (MORTAR, CARRIER-MOUNTED), CONTINUED)

TASK NUMBER		SL	PAGE
071-333-6511	*Install/operate auxiliary generator on M577 tracked vehicle. *M577 drivers only.	1	2-VII-B-11.1
	MORTAR (GENERAL)		
071-321-4002	Boresight mortar for elevation using the M2 compass.	2	2-VIII-E-1.1
071-321-4007	Lay mortar for direction using M2 compass (carrier-mounted).	2	2-VIII-E-2.1
071-321-4008	Supervise squad during the occupation of the firing position.	2	2-VIII-E-3.1
071-321-4006	Orient M2 aiming circle and lay mortars for direction.	2	2-VIII-E-4.1
071-321-4001	Boresight mortar for deflection using the M2 aiming circle.	2	2-VIII-E-5.1
071-321-4009	Lay mortar for direction using M2 compass (ground-mounted).	2	2-VIII-E-6.1
	FIRE WITHOUT AN FDC		
71-321-4050	Engage a target using fire without an FDC (direct lay and direct alinement).	1	2-VIII-F-1.1
71-321-4051	Adjust fire without an FDC, using direct alinement.	2	2-VIII-F-2.1
71-321-4052	Lay mortar for direction using direct alinement method (fire without FDC).	2	2-VIII-F-3.1
	LEADERSHIP AND TRAINING		
	LEADERSHIP		
71-328-5301	Inspect personnel/equipment.	2	2-IX-A-1.1
71-328-5302	Supervise maintenance on individual and TOE equipment.	2	2-IX-A-2.1
71-328-5304	Enforce preventive medicine program (includes personal hygiene).	2	2-IX-A-3.1
71-030-2501	Prepare the rater's section of an Enlisted Evaluation Report (EER).	2	2-IX-A-4.1

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TRAINING

TASK NUMBER		SL	PAGE
874-896-2001	Conduct a performance-oriented training session.	2	2-IX-B-1.1

DUTY POSITION TASKS - SKILL LEVEL 2

81-MM MORTAR SQUAD LEADER (GROUND-MOUNTED)

071-321-3901	Place a ground-mounted 81-mm mortar into action.	1	2-VIII-A-1
071-321-3902	Boresight 81-mm mortar.	1	2-VIII-A-2
071-321-3903	Perform safety checks on 81-mm mortar (ground- or carrier-mounted).	1	2-VIII-A-3
071-321-3904	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	1	2-VIII-A-4
071-321-3905	Prepare 81-mm mortar ammunition for firing.	1	2-VIII-A-5
071-321-3906	Perform operator maintenance on 81-mm mortar and associated fire control equipment.	1	2-VIII-A-6
071-321-3907	Remove a misfire from the 81-mm mortar (ground-mounted).	1	2-VIII-A-7
071-321-3909	Refer sight and realine aiming posts.	1	2-VIII-A-8
071-321-3910	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	1	2-VIII-A-9
071-321-3911	Manipulate mortar for traversing and searching fires.	1	2-VIII-A-1
071-321-4053	Fire a ladder mission using fire without an FDC (direct alinement).	2	2-VIII-F-4
071-321-4054	Fire a traversing mission using fire without an FDC.	2	2-VIII-F-5
071-321-4055	Engage a deep target using searching fire without an FDC.	2	2-VIII-F-6

81-MM MORTAR SQUAD LEADER (CARRIER-MOUNTED)

071-321-3912	Place a carrier-mounted 81-mm mortar into action.	1	2-VIII-B-1
071-321-3917	Remove a misfire from the 81-mm mortar (carrier-mounted).	1	2-VIII-B-2

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81-MM MORTAR SQUAD LEADER (CARRIER-MOUNTED), CONTINUED)

TASK NUMBER		SL	PAGE
071-321-3902	Boresight 81-mm mortar.	1	2-VIII-A-2.1
071-321-3903	Perform safety checks on 81-mm mortar (ground- or carrier-mounted).	1	2-VIII-A-3.1
071-321-3904	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	1	2-VIII-A-4.1
071-321-3905	Prepare 81-mm mortar ammunition for firing.	1	2-VIII-A-5.1
071-321-3906	Perform operator maintenance on 81-mm mortar and associated fire control equipment.	1	2-VIII-A-6.1
071-321-3909	Refer sight and realine aiming posts.	1	2-VIII-A-8.1
071-321-3910	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	1	2-VIII-A-9.1
071-321-3911	Manipulate mortar for traversing and searching fires.	1	2-VIII-A-10.1
071-321-4053	Fire a ladder mission using fire without an FDC (direct alinement).	2	2-VIII-F-4.1
071-321-4054	Fire a traversing mission using fire without an FDC.	2	2-VIII-F-5.1
071-321-4055	Engage a deep target using searching fire without an FDC.	2	2-VIII-F-6.1

107-MM (4.2-IN) MORTAR SQUAD LEADER (GROUND-MOUNTED)

071-322-4201	Ground mount 107-mm (4.2-in) mortar.	1	2-VIII-C-1.1
071-322-4202	Boresight 107-mm (4.2-in) mortar.	1	2-VIII-C-2.1
071-322-4203	Perform safety checks on 107-mm (4.2-in) mortar (ground- and carrier-mounted).	1	2-VIII-C-3.1
071-322-4204	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	1	2-VIII-C-4.1
071-322-4205	Prepare 107-mm (4.2-in) mortar ammunition for firing.	1	2-VIII-C-5.1
071-322-4206	Perform operator maintenance on 107-mm (4.2-in) mortar and equipment.	1	2-VIII-C-6.1
071-322-4207	Remove a misfire from the 107-mm (4.2-in) mortar (ground-mounted).	1	2-VIII-C-7.1

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(107-MM (4.2-IN) MORTAR SQUAD LEADER (GROUND-MOUNTED), CONTINUED)

TASK NUMBER		SL	PAGE
071-322-4208	Refer sight and realine aiming posts.	1	2-VIII-C-8.1
071-322-4209	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	1	2-VIII-C-9.1
071-322-4210	Manipulate mortar for traversing fire (ground- or carrier-mounted).	1	2-VIII-C-10.

107-MM (4.2-IN) MORTAR SQUAD LEADER (CARRIER-MOUNTED)

071-322-4212	Place carrier-mounted 107-mm mortar into action.	1	2-VIII-D-1.1
071-322-4216	Remove a misfire from the 107-mm mortar (carrier-mounted).	1	2-VIII-D-2.1
071-322-4202	Boresight 107-mm (4.2-in) mortar.	1	2-VIII-C-2.1
071-322-4203	Perform safety checks on 107-mm (4.2-in) mortar (ground- and carrier-mounted).	1	2-VIII-C-3.1
071-322-4204	Lay mortar for deflection and elevation (D&E) (ground-/carrier-mounted).	1	2-VIII-C-4.1
071-322-4205	Prepare 107-mm (4.2-in) mortar ammunition for firing.	1	2-VIII-C-5.1
071-322-4206	Perform operator maintenance on 107-mm (4.2-in) mortar and equipment.	1	2-VIII-C-6.1
071-322-4208	Refer sight and realine aiming posts.	1	2-VIII-C-8.1
071-322-4209	Reciprocally lay mortar using M2 aiming circle and place out aiming posts.	1	2-VIII- C-9.
071-322-4210	Manipulate mortar for traversing fire (ground- or carrier-mounted).	1	2-VIII-C-10

81-MM MORTAR COMPUTER

	Introduction to M16 Plotting Board.		2-V-A.1
071-321-1601	Prepare the M16 plotting board for operation as an observed chart and determine initial firing data for mortars (pivot point).	2	2-V-A-1.1
071-321-1602	Process subsequent FO corrections using M16 plotting board (pivot point).	2	2-V-A-2.1

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(81-MM MORTAR COMPUTER, CONTINUED)

TASK NUMBER		SL	PAGE
071-321-1603	Prepare M16 plotting board for operation as an observed chart (below pivot point) and modified observed chart.	2	2-V-A-3.1
071-321-1604	Process subsequent FO corrections using M16 plotting board as a modified observed chart.	2	2-V-A-4.1
071-321-1605	Determine data for sheaf adjustments.	2	2-V-A-5.1
071-321-1606	Determine data from re-registration and application of corrections.	2	2-V-A-6.1
071-321-1607	Record information on firing data sheet (81-mm).	2	2-V-A-7.1
071-321-1620	Determine firing corrections.	2	2-V-A-8.1
071-321-1621	Record meteorological (MET) data using MET data sheet (81-mm mortar).	2	2-V-A-9.1
071-321-1622	Determine and apply MET firing corrections (81-mm mortar).	2	2-V-A-10.1
	NOTE: Computers will also be responsible for the mortar gunnery tasks that correspond to the type platoon assigned.		

107-MM (4.2-IN) MORTAR COMPUTER

071-322-1608	Prepare a firing chart for operation and determine initial firing data.	2	2-V-B-1.1
071-322-1609	Process subsequent FO corrections using the firing chart.	2	2-V-B-2.1
071-322-1610	Determine data for sheaf adjustment.	2	2-V-B-3.1
071-322-1611	Determine data from re-registration and application of corrections to FDC equipment.	2	2-V-B-4.1
071-322-1612	Record information on firing data sheet (107-mm (4.2-in)).	2	2-V-B-5.1
071-322-1613	Record meteorological (MET) data using MET data sheet (107-mm mortar).	2	2-V-B-6.1
071-322-1615	Determine and apply MET firing corrections.	2	2-V-B-7.1

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(107-MM (4.2-IN) MORTAR COMPUTER, CONTINUED)

TASK NUMBER		SL	PAGE
071-322-1616	Apply registration corrections to the fire control equipment for the 107-mm mortar.	2	2-V-B-8.1
071-322-1617	Determine data for 107-mm (4.2-in) mortar using the M16 plotting board and GFS.	2	2-V-B-9.1
	NOTE: Computers will also be responsible for the mortar gunnery tasks that correspond to the type platoon assigned.		
Appendix A	Consolidated List of References		A-1
Questionnaire			Q-1
Re-order Form			

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION I
BATTLEFIELD SURVIVAL

TASK SUMMARIES

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INTRODUCTION TO FIRST AID

Since a medic cannot be with every soldier, your life and the lives of other soldiers may depend upon how much you know about first aid.

First aid is the emergency or lifesaving care given to a sick, injured, or wounded person when a medically trained person is not immediately available. Without this emergency care, a sick, injured, or wounded person may not live until he can receive medical treatment. It is important that everyone know how to apply lifesaving first aid measures, especially the soldier on the training field or battlefield.

This material is designed to be a handy guide when an emergency arises. For this reason, it contains only essential information about real emergencies which you may face and should be able to handle. To learn how to apply all first aid measures, you should read FM 21-11.

1. **Lifesaving Measures:**

a. **Open airway and restore breathing and heartbeat.** Lack of oxygen intake (through breathing and heartbeat) leads to death in a very few minutes.

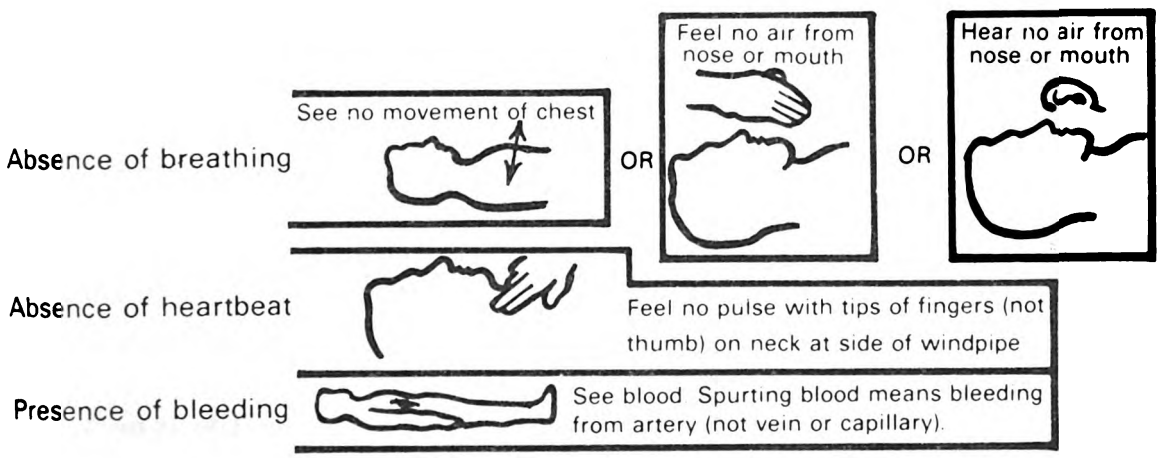
b. **Stop bleeding.** Life cannot continue without adequate volume of blood to carry oxygen to tissues.

c. **Prevent shock.** Unless shock is prevented or corrected, death may result even though injury would not otherwise be fatal.

d. **Dress and bandage wounds to avoid infection.** Healing of wound and recovery depend to great extent upon how well the wound was protected from contamination initially.

2. **Basic Guides:**

a. **Examine promptly and calmly for:**


Absence of breathing
See no movement of chest
OR
Feel no air from nose or mouth
OR
Hear no air from nose or mouth
Absence of heartbeat
Feel no pulse with tips of fingers (not thumb) on neck at side of windpipe
Presence of bleeding
See blood Spurting blood means bleeding from artery (not vein or capillary).

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b. **Apply lifesaving measures a and b instantly.**

If no sign of breathing ..... Open airway (a).
If still no sign of breathing ..... Start artificial respiration (a).*
If no pulse or only very weak, irregular pulse ..... Start closed-chest heart massage with artificial respiration (a).*
If bleeding ..... Apply pressure (b).

*Continue until the person regains consciousness, until you are relieved by medically trained person, or for at least 45 minutes in the absence of all life signs.

c. **Re-examine immediately head-to-toe and front-to-back for:**

(1) Other injuries -- Fractures, injuries without associated wounds, etc.

(2) Signs of shock -- Early signs: Restlessness, thirst, pale skin, rapid heartbeat. May be excited or appear calm and very tired; may be sweating although skin is cool and clammy. Signs when shock becomes worse: Fast breaths or gasps; staring into space; blotchy or bluish skin, especially around mouth.

d. **Apply lifesaving measures c and d promptly.** Apply shock prevention and control measures (c). Dress and bandage wounds to avoid infection (d).

e. **Arrange evacuation to nearest medical treatment facility.**

3. Do Nots: (To act incorrectly can be just as serious or fatal to a wounded soldier as the failure to administer a lifesaving measure.)

a. **Do not let soldier remain on his back if he is unconscious or has face or neck wound.**

b. **Do not pull or tear clothing from injured soldier.**

c. **Do not touch or try to clean dirty wounds, including burns.**

d. **Do not remove dressings and bandages once they have been placed over wound.**

e. **Do not loosen tourniquet once it has been applied.**

f. **Do not move soldier with fracture until it has been properly splinted unless necessary to save his life.**

g. **Do not give fluids to soldier who is unconscious, nauseated, or vomiting or has abdominal or neck wound.**

h. **Do not permit head to be lower than body when soldier has head injury.**

i. **Do not try to push protruding intestines or brain tissue back into wound.**

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j. **Do not put any medication on burns.**

k. **Do not try to give first aid measures which are unnecessary or beyond your capabilities.**

l. **Do not fail to resupply your first aid case with items used from it.**

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TASK NUMBER: 081-831-1004

PERFORM MOUTH-TO-MOUTH RESUSCITATION AND EXTERNAL HEART MASSAGE

CONDITIONS:

Situation 1--Given an unconscious casualty who has stopped breathing but still has a heartbeat.

Siutation 2--Given an unconscious casualty who has stopped breathing and has no heartbeat, and one soldier to assist.

STANDARDS:

Situation 1--Properly apply mouth-to-mouth resuscitation until the casualty resumes breathing or until relieved, IAW performance measures below.

Situation 2--Properly apply mouth-to-mouth resuscitation and external heart massage using the ONE RESCUER method without assistance. Then shift to the TWO RESCUER method as assistance becomes available, and continue until the heartbeat and breathing are restored or until relieved, IAW performance measures below.

PERFORMANCE MEASURES:

1. Apply mouth-to-mouth resuscitation.

a. Upon finding an unconscious person, the rescuer must determine if the victim is breathing.

b. The victim will be placed on his back with the rescuer kneeling alongside the victim's head. First clear the airway by inserting the fingers into the victim's mouth and removing any obstruction, then place one hand (hand nearest victim's feet) under the victim's neck and the other hand on the victim's forehead. By lifting with the hand under the neck and pushing down on the forehead, the neck is extended, the tongue is lifted away from the back of the throat, and the airway is opened (figure 1).

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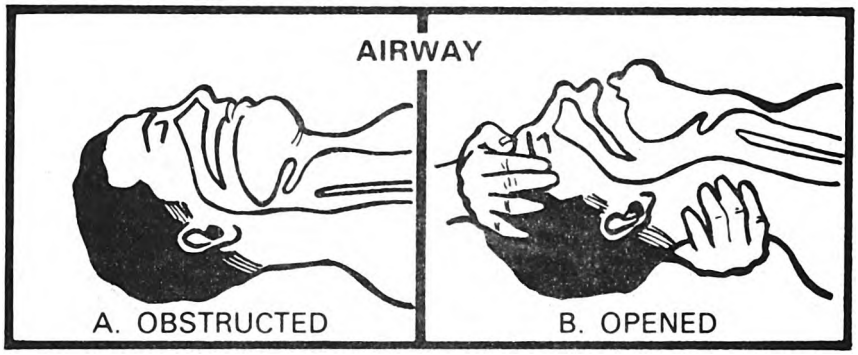

Figure 1.

c. After opening the airway, LOOK, LISTEN, and FEEL to determine if the victim is breathing. To do this, place the ear close to the victim's mouth and nose (figure 2).

Figure 2.

Hold this position for 5 seconds since it could be 5 seconds between the victim's breaths.

(1) LOOK to see if the victim's chest is rising and falling as he exhales.

(2) LISTEN and FEEL for exhaling of air on the ear and cheek.

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d. If there are no signs of respiration, begin mouth-to-mouth resuscitation.

(1) To perform mouth-to-mouth resuscitation, the rescuer will use the hand under the victim's neck to maintain the head in a position of maximum backward tilt and continue to press down on the victim's forehead with the other hand (figure 3), and rotate this hand so that the victim's nostrils can be pinched together between the thumb and index finger (figure 4). The rescuer opens his mouth wide, takes a deep breath, places his mouth over the victim's mouth, makes an airtight seal with his lips, and blows into the victim's mouth (figure 5).

Figure 3.

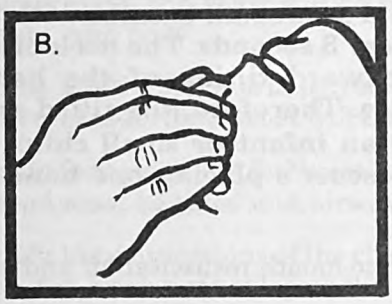

Figure 4.

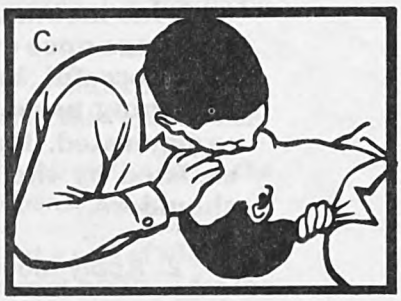

Figure 5.

(2) The rescuer will then remove his mouth, turn his head, and again LOOK, LISTEN, and FEEL for the exhaled air (figure 6).

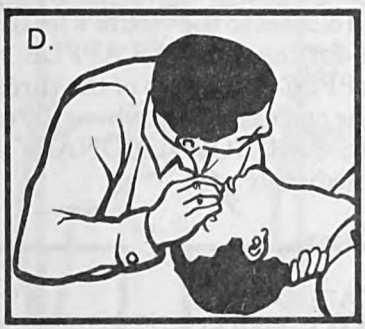

Figure 6.

(3) This procedure will be repeated once every 5 seconds for as long as needed.

NOTE: When starting artificial respiration, the first time the rescuer blows in the victim's mouth, he will give four quick but full breaths to make sure the victim's lungs are fully inflated.

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e. If, when starting the procedure, strong resistance is felt when the rescuer blows into the victim's mouth, quickly reposition the victim's head and try again. If airway is still not clear, roll the victim onto his side; using heel of hand, deliver sharp blows between his shoulder blades to dislodge foreign objects. If abdomen bulges (air going into stomach), apply gentle pressure on abdomen with hand to force air out of stomach. If this procedure causes the victim to vomit, quickly turn him onto his side, clean out his mouth, and resume the cycle.

NOTE: The procedures for opening the airway and performing artificial respiration for children are essentially the same as those for adults, but there are some differences. For infants and small children, the rescuer covers both the mouth and nose of the child with his mouth and uses small breaths with less volume to inflate the lungs once every 3 seconds. The neck of an infant is so pliable that forceful backward tilting of the head may obstruct the breathing passages. Therefore, the tilted position should not be exaggerated. For an infant or small child, the head tilt may be assisted by the rescuer's placing one hand beneath the victim's shoulders.

2. Apply mouth-to-mouth resuscitation and external heart massage.

a. Upon finding an unconscious casualty, in addition to checking to see if he is breathing, the rescuer should also determine if he has a heartbeat.

b. First clear the airway by inserting the fingers into the victim's mouth and removing any obstruction, then open the airway and LOOK, LISTEN, and FEEL for breathing. At the same time, FEEL for a heartbeat. To do this, keeping the head in the tilted back position, remove the hand under the neck (hand closest to the victim's feet) and place the fingers on the victim's throat. Feel for the ADAM'S APPLE, and slide the fingers down from the ADAM'S APPLE to the side of the throat (figure 7). This will place the fingertips over the carotid artery where the carotid pulse can be felt. If a pulse cannot be felt, CARDIOPULMONARY RESUSCITATION (CPR) must be started immediately.

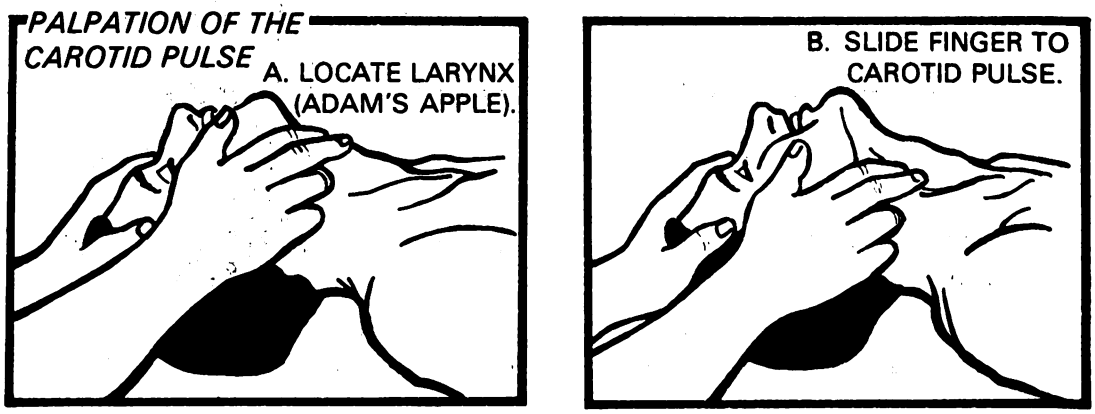

Figure 7.

2-I-A-2.4

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c. It is important that CPR be started quickly as permanent brain damage may occur if deprived of oxygenated blood.

0-4 Min	4-6 Min	6-10 Min	Over 10 Min
BRAIN DAMAGE NOT LIKELY	BRAIN DAMAGE PROBABLE	BRAIN DAMAGE VERY LIKELY	BRAIN DAMAGE ALMOST CERTAIN

d. External heart massage is effective in providing artificial circulation because the heart lies between the breastbone and the backbone. When the chest is compressed, the heart will be squeezed, forcing blood through the lungs, brain, and body.

e. To perform the ONE RESCUER procedure of mouth-to-mouth resuscitation and heart massage, the rescuer will kneel at the victim's side.

(1) He will apply four quick, but full breaths to the victim to fill the lungs with oxygen (head must be tilted and airway open).

(2) He will apply 15 compressions of the chest at a rate of 80 counts per minute. To do this, the rescuer must locate the correct position for the hands. (If the hands are too high or too low on the chest, the heart will not be compressed.) To locate the correct position for the hand, first locate the tip of the breastbone and measure two finger-widths up from this tip. Place the heel of the other hand alongside the fingers (figure 8).

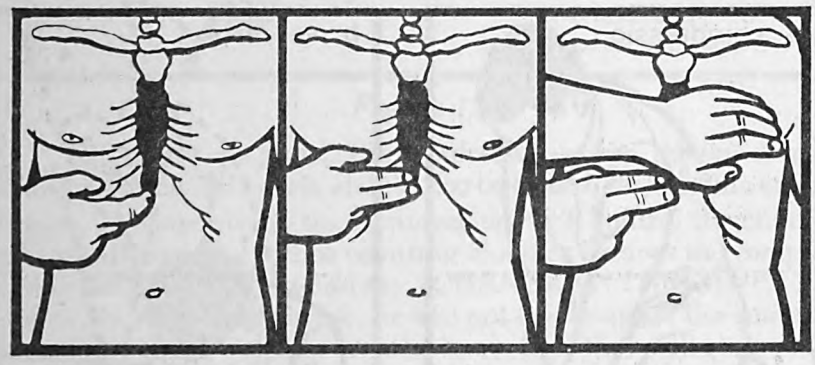

Figure 8.

NOTE: The tip of the breastbone can be felt through the victim's clothing.

(3) After placing the one hand in the correct position, place the other hand on top of the first hand and interlace the fingers (figure 9).

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(4) When the upper part of the body is brought forward, the arms will become vertical and the elbows will be kept locked as the weight of the upper body is applied to the chest. The chest of the victim will be compressed 1½ to 2 inches (figure 10).

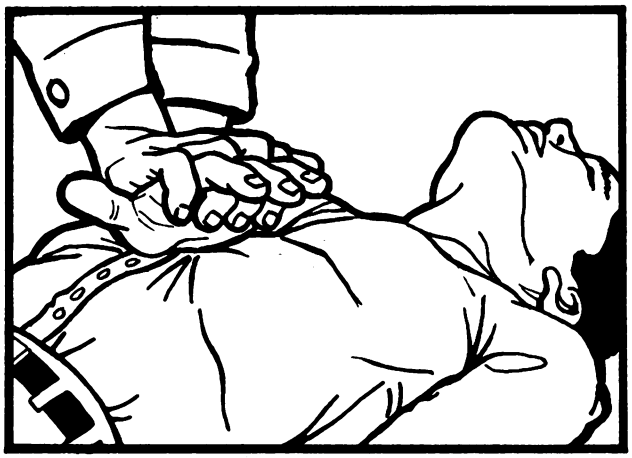

Figure 9.

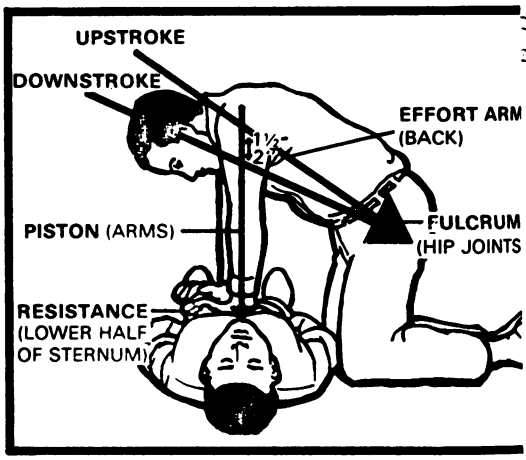

Figure 10.

(5) The chest will be compressed 15 times at a count of 80 compressions per minute. Then shift position slightly and apply two quick, but full breaths (tilt head, open airway). Continue this cycle--15 compressions to two breaths--until relieved (figure 11).

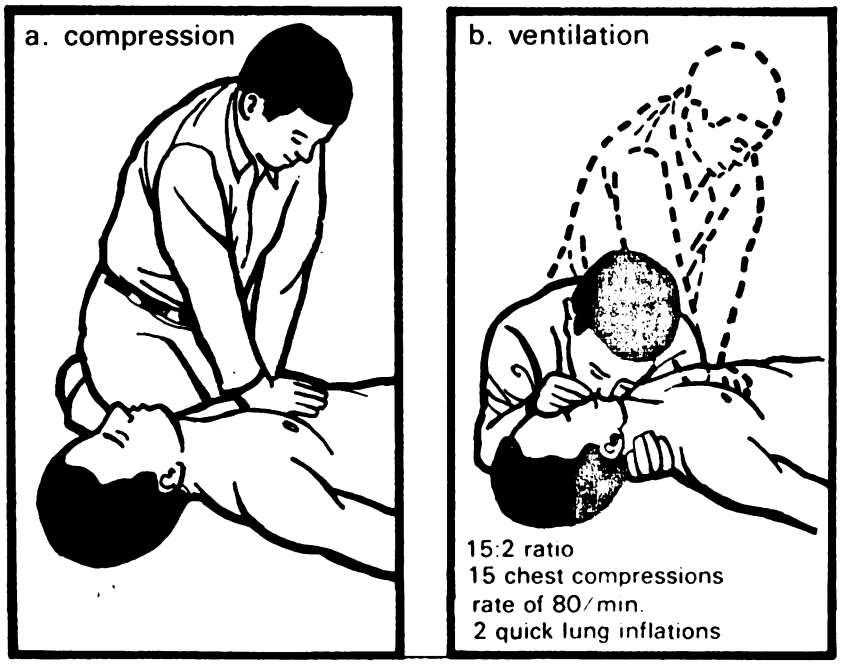

Figure 11.

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TASK NUMBER: 081-831-1005

STOP BLEEDING (ARM OR LEG)

CONDITIONS:

Given a casualty with a bleeding arm or leg wound and requiring no other first aid; field first-aid dressings or any available cloth; material to apply a tourniquet if required; and the absence of qualified medical personnel.

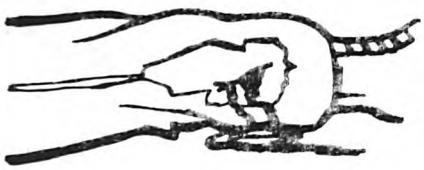
STANDARDS:

Perform the lifesaving measure of stopping the bleeding IAW with the performance measures below.

PERFORMANCE MEASURES:

1. Check for more than one wound.	A missile usually makes smaller wound where it enters than where it exits.

2. Cut and lift clothing from wound.	Tearing clothing results in rough handling of injured part.



3. Prevent further contamination of wound. Don't touch wound.	Any attempt to clean wound only contaminates it more. If found dirty, leave dirty.

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4. Cover wound and apply pressure.

(a) After you cut and lift clothing from wound, remove wrapped dressing (with attached bandages) from plastic envelope; then twist to break paper wrapper.

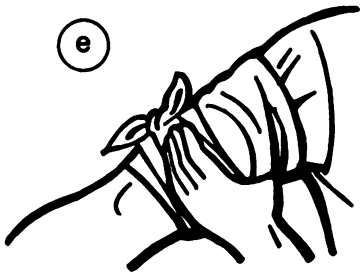
(b) Grasp folded bandages with hands, being careful not to touch side of dressing which goes next to wound.

(c) Place dressing on wound without allowing it to touch anything else.

(d) Wrap bandages around the part and tie ends securely with square knot.

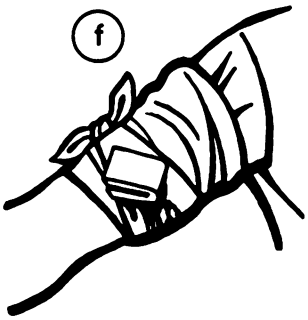
NOTE: The bandages attached to field first aid dressing are split 4-6 inches from the loose ends. They may be split farther to make four tails long enough for securing bandages around the head.

(e)

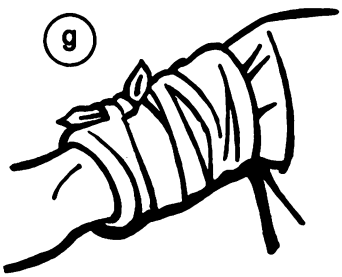


If bleeding continues, press wound with hand for 5-10 minutes.

(f)



(g)



Additional pressure can be applied to wound with thick pad (rag) firmly secured with a strip of material.

NOTE: If no first aid dressing is available, use any available cloth. Once dressing is applied, don't remove.

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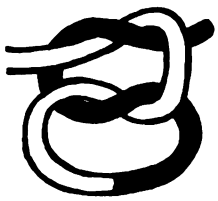
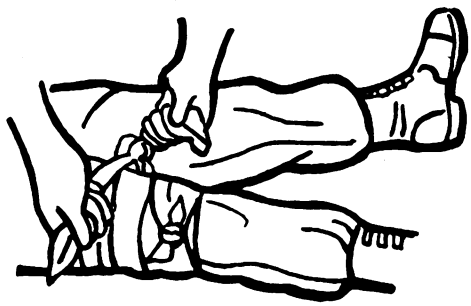
(a) Make a loop around the limb with any flexible material; tie with square knot.



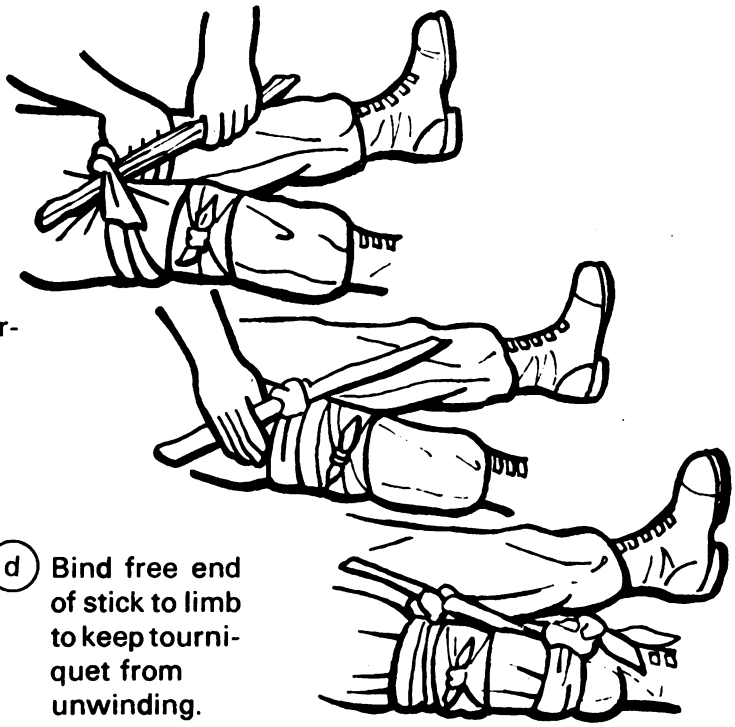
SQUARE KNOT



(b) Pass a stick, scabbard, or bayonet under the loop.

(c) Tighten tourniquet just enough to stop arterial bleeding.

(d) Bind free end of stick to limb to keep tourniquet from unwinding.



REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 4, pages 29-35)
TC 21-11, Pocket Medic, Mar 75 (pages 20-27)
TEC Lesson 911-441-0028-F, Basic First Aid Measures; Stopping the Bleeding, Part 1
TEC Lesson 911-441-0029-F, Basic First Aid Measures; Stopping the Bleeding, Part 2
TEC Lesson 911-441-0031-F, Dressings and Bandages, Part 1
TEC Lesson 911-441-0032-F, Dressings and Bandages, Part 2

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TASK NUMBER: 081-831-1006

IDENTIFY SIGNS OF AND TREAT FOR SHOCK

CONDITIONS:

Given the absence of qualified medical personnel and a casualty who shows signs of any of the following: restlessness, thirst, paleness of skin or rapid heartbeat.

STANDARDS:

Apply lifesaving measures to treat for shock IAW the performance measures below.

PERFORMANCE MEASURES:

NOTE: Shock may result from any injury but is more likely to develop in severe injuries.

Warning signs:	May be:	Signs as shock gets worse:
Restlessness	Excited or appear calm and tired	Small fast breaths or gasps
Thirst		Staring vacantly into space
Paleness of skin	Sweating when skin feels cool and clammy	Blotchy or bluish skin, especially around mouth
Rapid heartbeat		

1. **Maintain adequate respiration and heartbeat.** This may entail only clearing soldier's upper airway, positioning him to insure drainage of any fluid blocking airway, and observing him to insure airway remains clear. However, you may need to give him artificial respiration and closed-chest heart massage (TC 21-11, pages 12-19).

2. **Stop bleeding.** See task: **Stop Bleeding.**

3. Loosen clothing at neck, waist, and other places where it tends to bind. Loosen, but do not remove shoes.

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4. **Reassure soldier.**

Take charge. Show by your calm self-confidence and gentle yet firm actions that you know what you are doing and that you expect him to feel better because you are helping him. If he asks questions about the seriousness of his injury, explain that a physician will have to examine him to determine the extent of injury. Ill-timed or incorrect information can increase a person's anxiety.

5. **Splint fractures. See task: Splint a Fracture.**

6. **Position soldier.**

(Splint any fracture first)

If conscious--On back with feet raised 6" to 8"

If unconscious--On side or abdomen with head turned to side.

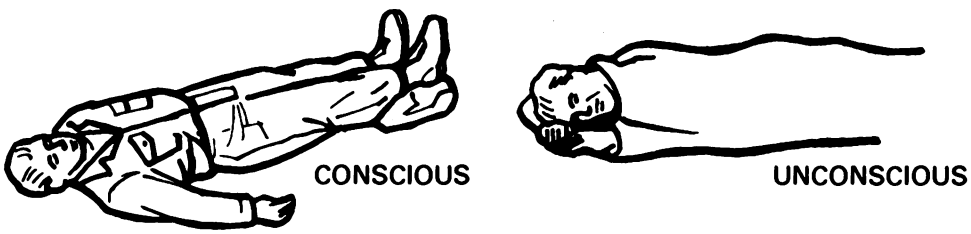
Vary position for:

Head injury--Head also raised higher than body.

Face and neck wound--Sit, lean forward with head down or in unconscious position.

Sucking wound of chest--Sit or lie on injured side.

Abdominal wound--On back with head turned to side.



7. **Keep soldier comfortably warm.**

Place suitable material (poncho, blanket, etc.) under him as well as over him if weather makes necessary. If weather permits, remove any wet clothing except boots.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 5, pages 36-39)
TC 21-11, Pocket Medic, Mar 75 (part 1, pages 28-29)
TEC Lesson 911-441-0029-F, Basic First Aid Measures: Controlling for Shock

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TASK NUMBER 081-831-1007

SPLINT A FRACTURE

CONDITIONS:

Given a casualty who has a fracture (closed or open) and material for field expedient splints. The necessary lifesaving measures have already been performed and no qualified medical personnel are available.

STANDARDS:

Splints are applied to the fracture (open or closed) IAW performance measures below.

FRACTURES

Closed fracture: Break in bone without break in overlying skin.

Open fractures: Break in bone as well as overlying skin.

Fractures must be splinted (immobilized) to prevent razor-sharp edges of bone from moving and cutting tissue, muscle, blood vessels, and nerves; to reduce pain and help control shock; and to prevent closed fractures from becoming open fractures.

First Aid:

1. "Splint them where they lie" - Splint (immobilize) fractured part without changing position of part and before moving injured person. If bone is in unnatural position, do not straighten it. If person must be moved to save his life, such as from enemy fire or a burning building, tie fractured part, grasp him under arm pits and pull him in straight line.

2. Apply splint so joint above fracture and joint below fracture are immobilized.

3. Use padding between injured part and splint.

4. Secure splint to part with bandages at several points above and below fracture (NOT across fracture); tie bandages against splint with square knot.

5. Use sling to support splinted arm bent at elbow and fractured elbow which is bent.

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PERFORMANCE MEASURES:

1. Cover any wound or bone sticking through the skin with a clean dressing as you would any other wound. Stop any bleeding.

2. Apply padding if available between injured part and splint. If no padding is available, splint anyway.

NOTE: Do not cover the fracture with the padding material.

3. Apply the splint. Splint should extend past the joints above and below the fracture.

NOTE: Do not move the individual and do not attempt to change the position of the fractured part.

4. Bind the splint.

   a. All knots must be against the splint.

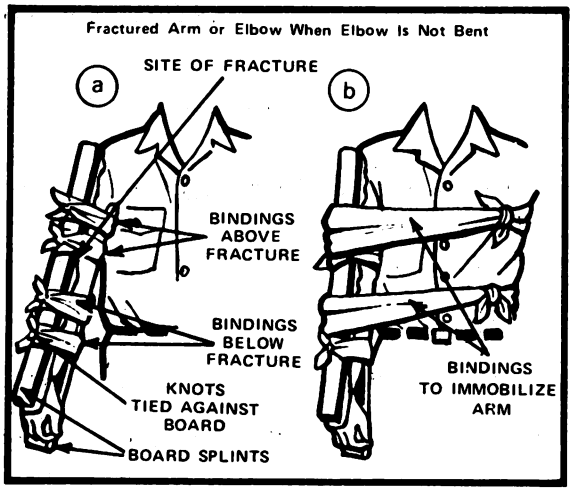
   b. Bindings must be placed both above and below the fracture.

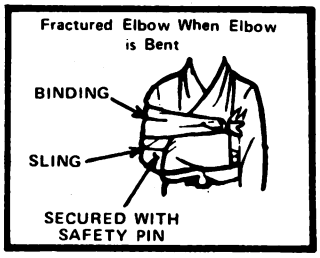
NOTE: Blood circulation must not be impaired by splint, padding, or bindings.

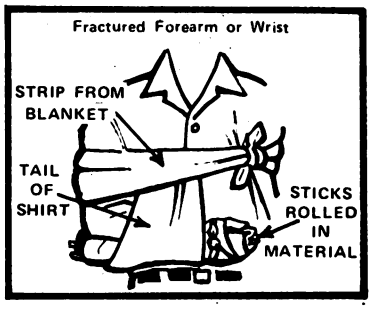
NOTE: Do NOT place bindings across the fracture.

5. Collect splinting materials. Splints may be improvised from such items as boards, poles, sticks, tree limbs, unloaded rifles, etc. Padding may be improvised from such items as a jacket, poncho, shelter half or leafy vegetation.

FRACTURED ARM, ELBOW, OR WRIST







REFERENCES:

FM 21-11, First Aid for Soldiers, 30 Jun 76 (Chap 8, pages 66-67)

TC 21-11, Pocket Medic, 14 Mar 75 (Part 2, pages 44-48)

TEC Lesson 911-441-0030-F, Fractures and Splinting

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TASK NUMBER: 081-831-1008

APPLY FIRST AID MEASURES FOR BURNS

CONDITIONS:

During daylight in a field location, given a casualty or dummy with a burn, sodium chloride-sodium bicarbonate mixture (salt packet), two sterile dressings, and a canteen of cold water. The casualty is conscious, is not vomiting, and has no other wounds. His clothing may or may not be stuck to the burn.

STANDARDS:

Within 5 minutes, administer first aid for burns IAW the performance measures below.

PERFORMANCE MEASURES:

1. Protect the burn against further contamination as follows to lessen the possibility of infection:

a. If clothing covers the burn, cut and lift it gently away without touching the burn.

(1) Do not try to remove pieces of cloth which have stuck to the burn or to clean the burn in any way.

(2) Do not pull clothes over the burned area.

(3) Do not break blisters.

(4) Do not put ointment or any medication whatsoever on the burn.

b. Place a sterile dressing over the burned area and secure it in place with bandages.

2. Prevent shock by applying the measures discussed in the task: **Identify signs of and treat for shock.**

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a. If size of burn is less than 1 square foot, have the casualty drink the water from his canteen. If size of burn is over 1 square foot and the casualty is conscious, is not vomiting, and has no abdominal or neck wound, give him the sodium chloride-sodium bicarbonate mixture included in the first-aid kit. Dissolve one envelope (4.5 grams) of the mixture in one canteenful or quart of cool or cold water. Never use warm water, as this often causes vomiting.

b. Give the solution to the casualty slowly, having him consume the entire amount over a 1-hour period. Should the casualty become nauseated, stop giving him the solution.

c. Get the casualty to a medical treatment facility as soon as possible.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 7, pages 61-62)
TC 21-11, Pocket Medic, Mar 75 (part 2, page 43)
TEC Lesson 911-441-0033-F, Burns and Eye Injuries

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TASK NUMBER: 081-831-1010

APPLY FIRST AID FOR SUN OR HEAT INJURIES

CONDITIONS:

Given a casualty suffering from a heat injury (heat cramps, heat exhaustion, heat stroke), a canteen of water, and a field first aid pouch containing two envelopes sodium chloride-sodium bicarbonate mixture (burn packet).

STANDARDS:

Casualty's signs and symptoms are identified in accordance with the performance measures and initial care is begun immediately to reduce the seriousness of the injury.

PERFORMANCE MEASURES:

Identify type of injury.

1. **Heat cramps.**

a. Signs/symptoms - Muscle cramps of abdomen, legs, or arms.

b. First aid.

(1) Move casualty to shade and loosen clothing.

(2) Give him large amounts of cool salt water slowly. Prepare salt water by dissolving the contents of one burn packet in one canteen of cool water.

2. **Heat exhaustion.**

a. Signs/symptoms - Headache, excessive sweating, weakness, dizziness, nausea, muscle cramps. Pale, cool, moist clammy skin.

b. First aid.

(1) Lay casualty in cool shaded area and loosen his clothing.

(2) Give him large amounts of cool salt water slowly. Prepare salt water by dissolving the contents of one burn packet in one canteen of cool water.

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(3) Get the casualty to a medical treatment facility as soon as possible.

NOTE: For units isolated and not able to evacuate casualty: if he is conscious, have him drink 3 to 5 canteenfuls of cool salt water during a period of 12 hours.

3. **Heat stroke (sunstroke).**

a. Signs/symptoms-Stoppage of sweating (hot, dry skin). Collapse and unconsciousness may come suddenly or may be preceded by headache, dizziness, fast pulse, nausea, vomiting, and mental confusion.

b. First aid.

(1) Promptly immerse person in coldest water available. Add ice, if available, to water. If you cannot immerse him, get him into shade, remove his clothing, keep his entire body wet by pouring water over him, and fan his wet body continuously.

(2) Transport him to nearest medical facility at once, cooling his body on the way.

(3) If he becomes conscious, give him cool salt water prepared as described for "heat cramps".

NOTE: If casualty becomes nauseated, stop giving him the solution but keep it available for him to drink later.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 9, pages 84, 88-90)
TC 21-11, Pocket Medic, Mar 75 (part 3, pages 59-60)
TEC Lesson 911-444-0034-F, Snake Bites and Hot Weather Hazards

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TASK NUMBER: 081-831-1011

APPLY FIRST AID FOR WET OR COLD INJURIES

CONDITIONS:

Given a casualty suffering from a wet or cold injury (frostbite, immersion foot, trench foot, snow blindness).

STANDARDS:

Casualty's signs and symptoms are identified in accordance with the performance measures and initial care is begun immediately to reduce the seriousness of the injury.

PERFORMANCE MEASURES:

Identify type of injury.

1. **Frostbite.**

a. Signs/symptoms - Skin is white, stiff, and numb.

b. First aid —

(1) Cover frostbitten part of face with warm hands until pain returns.

(2) Place frostbitten bare hands next to skin in opposite armpits.

(3) If feet are frostbitten, seek sheltered area and place bare feet under clothing and against abdomen of another person.

(4) If deep frostbite is suspected, protect part from additional injury and get to medical treatment facility by fastest means possible. **DO NOT** attempt to thaw deep frostbite. There is less danger of walking on feet while frozen than after thawed.

2. **Immersion foot.**

a. Signs/symptoms - Soles of feet are wrinkled. Standing or walking is extremely painful.

b. First aid —

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

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Figure 1. Immersion foot.

3. **Trench foot.**

a. Signs/symptoms - Numbness. May be tingling or aching sensation, cramping pain, and swelling.

b. First aid —

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

Figure 2. Trench foot.

4. **Snow blindness.**

a. Signs/symptoms - Scratchy feeling in eyes.

b. First aid —

(1) Cover eyes with dark cloth.

(2) Transport casualty to medical treatment facility at once.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 9, pages 90-91)
TC 21-11, Pocket Medic, Mar 75 (part 3, page 61)
TEC Lesson 911-441-0035-F, Cold Weather Hazards

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TASK NUMBER 092-503-1001

PERFORM OPERATOR'S MAINTENANCE ON AN M17 SERIES PROTECTIVE MASK

CONDITIONS:

Given an M17 series protective mask, carrier, accessories authorized to be stored in the carrier (per unit SOP), TM 3-4240-279-10, a pail of soapy water, a pail of clear rinse water, rags, and a small brush.

STANDARDS:

1. All components and accessories authorized by unit SOP are present; any which are missing are reported to your supervisor.

2. All deficiencies not requiring higher echelon support have been corrected. Those which do require such support are reported to your supervisor.

3. Mask and carrier are free of dirt, sand, and grit.

PERFORMANCE MEASURES:

1. **To inspect mask and carrier.**

a. Remove the mask from the carrier and check to insure that all components are present (figure 1). Insure that accessories authorized by your unit SOP are present (figure 2). Inform your supervisor if any components or accessories are missing.

b. Check the carrier for dirt, mildew, rips, torn straps, and missing hardware.

c. Check the facepiece for holes, tears, splits, and signs of deterioration of rubber parts.

d. Check the filter elements to make sure that they are serviceable and properly installed.

e. Check outserts for scratches, discoloration, or distortion that could affect vision.

f. Check the head harness for dirt and mildew; worn, frayed, or broken straps; and missing clinch tips.

g. Check the hood (if present) for holes, rips, tears, or excessive wear. The hood is unserviceable if it has more than two pinholes in any one panel.

h. Correct deficiencies which you are authorized to correct at your level (see TM 3-4240-279-10, sec III, page 3-5 through 3-12).

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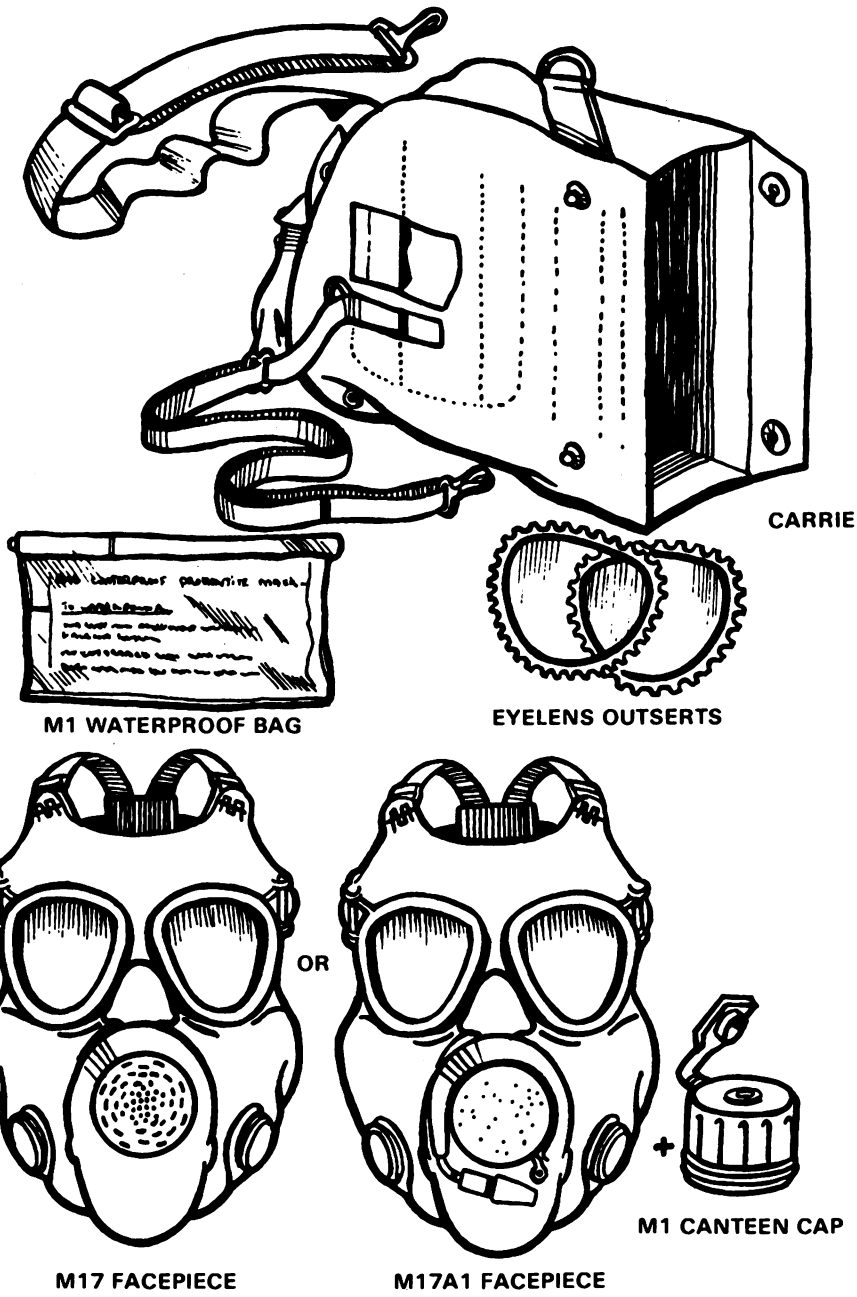

Figure 1.

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i. Notify your supervisor of any deficiencies which must be corrected at a higher level.

2. **To clean the mask (without removing filter elements).**

a. Do not remove the hood if it is attached to the mask.

b. Remove the voicemitter-outlet cover, inlet valve caps, and eyelens outserts.

c. Clean the mask inside and out with a cloth dipped in warm, soapy water (wrung almost dry) or a brush with soft bristles, being careful not to wet the filter elements.

d. Rinse with a cloth dipped in warm, clear water (wrung almost dry).

e. Wipe the facepiece with a clean, lint-free cloth or air-dry.

f. If the nosecup valve disks become detached while the mask is being cleaned, reinstall them.

g. Reassemble the mask.

3. **To clean the carrier.**

a. Empty the carrier pockets.

b. Brush the carrier both inside and outside to remove sand or grit.

c. If the carrier is soiled, clean it with a brush dipped in clear, cold water.

d. Put components and authorized accessories back in the carrier.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, May 71 (chap 4, sec I, pages 4-4 to 4-6)
TM 3-4240-279-10, Mask Chemical-Biological Field, ABC-M17A1, M17 and Accessories, Aug 75 (chap 3, pages 3-1 to 3-14)
TEC Lesson 931-061-0065A, NBC: Maintenance of the M17 Series Mask

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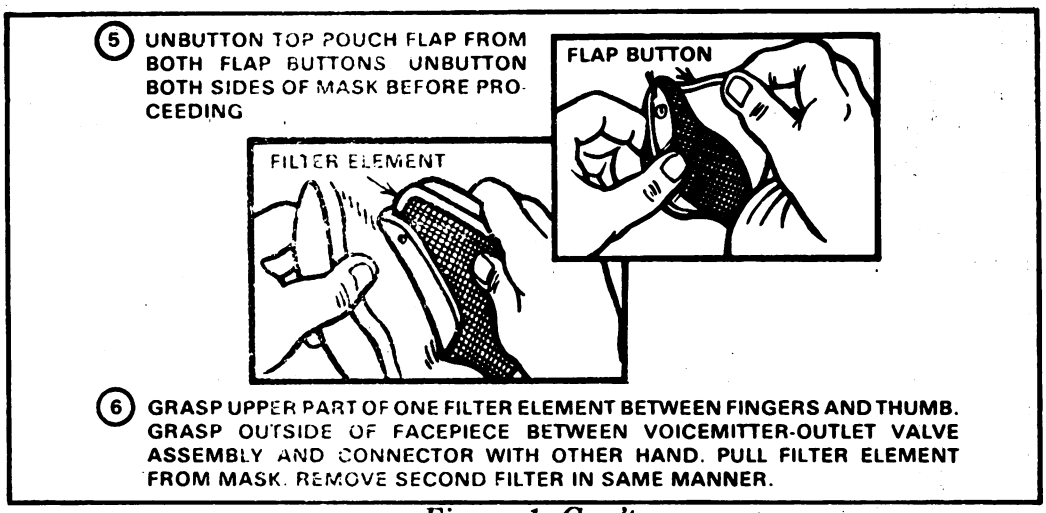
5 UNBUTTON TOP POUCH FLAP FROM BOTH FLAP BUTTONS UNBUTTON BOTH SIDES OF MASK BEFORE PROCEEDING
FLAP BUTTON
FILTER ELEMENT
6 GRASP UPPER PART OF ONE FILTER ELEMENT BETWEEN FINGERS AND THUMB. GRASP OUTSIDE OF FACEPIECE BETWEEN VOICEMITTER-OUTLET VALVE ASSEMBLY AND CONNECTOR WITH OTHER HAND. PULL FILTER ELEMENT FROM MASK. REMOVE SECOND FILTER IN SAME MANNER.

Figure 1. Con't.

3. To replace the filter elements, follow the steps outlined in figure 2.

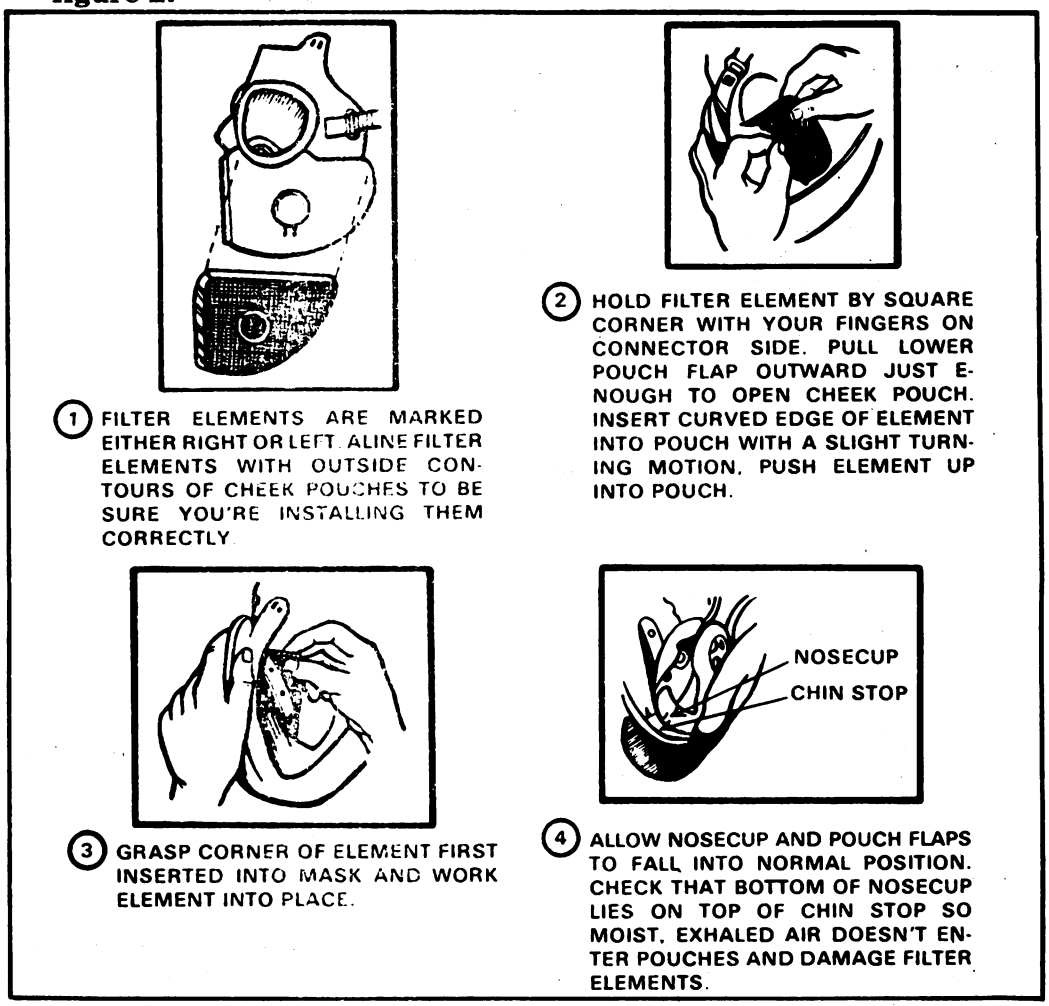
1 FILTER ELEMENTS ARE MARKED EITHER RIGHT OR LEFT. ALINE FILTER ELEMENTS WITH OUTSIDE CONTOURS OF CHEEK POUCHES TO BE SURE YOU'RE INSTALLING THEM CORRECTLY
2 HOLD FILTER ELEMENT BY SQUARE CORNER WITH YOUR FINGERS ON CONNECTOR SIDE. PULL LOWER POUCH FLAP OUTWARD JUST ENOUGH TO OPEN CHEEK POUCH. INSERT CURVED EDGE OF ELEMENT INTO POUCH WITH A SLIGHT TURNING MOTION. PUSH ELEMENT UP INTO POUCH.
3 GRASP CORNER OF ELEMENT FIRST INSERTED INTO MASK AND WORK ELEMENT INTO PLACE.
NOSECUP
CHIN STOP
4 ALLOW NOSECUP AND POUCH FLAPS TO FALL INTO NORMAL POSITION. CHECK THAT BOTTOM OF NOSECUP LIES ON TOP OF CHIN STOP SO MOIST, EXHALED AIR DOESN'T ENTER POUCHES AND DAMAGE FILTER ELEMENTS.

Figure 2. Installing filter elements.

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TASK NUMBER: 092-503-1002

PUT ON AND WEAR A PROTECTIVE MASK

CONDITIONS:

In a field or garrison situation, wearing standard individual combat gear, to include a protective mask carrier worn in an authorized carrying position, containing a prefitted M17 series protective mask and given a standard alarm for an NBC attack or exposed to CS gas without warning.

STANDARDS:

1. Within 9 seconds, put on, seat, and clear the protective mask.

2. Within an additional 6 seconds, secure the hood (if present) in accordance with the performance measures below.

3. Secure underarm straps to the hood (if present) before continuing the mission.

NOTE: If exposed to CS gas without warning, remain masked for an additional 2 minutes.

PERFORMANCE MEASURES:

1. Upon becoming aware of a chemical-biological attack, stop breathing, remove headgear, and open the carrier with the left hand. (Headgear may be placed between the legs or on the muzzle of a rifle held between the legs. This is important in a contaminated area and should be practiced in training. If dropped, however, continue to mask and decontaminate the equipment afterward.)

2. Hold the carrier open with the left hand and with the other grasp the mask just below the eyepieces and remove the mask.

3. Grasp the facepiece with both hands, sliding the thumbs up inside, so that the facepiece is open to the fullest extent.

4. Place chin in the chin pocket, then pull the head harness over the head, making sure that all head straps are straight and the head pad is centered (figure 1).

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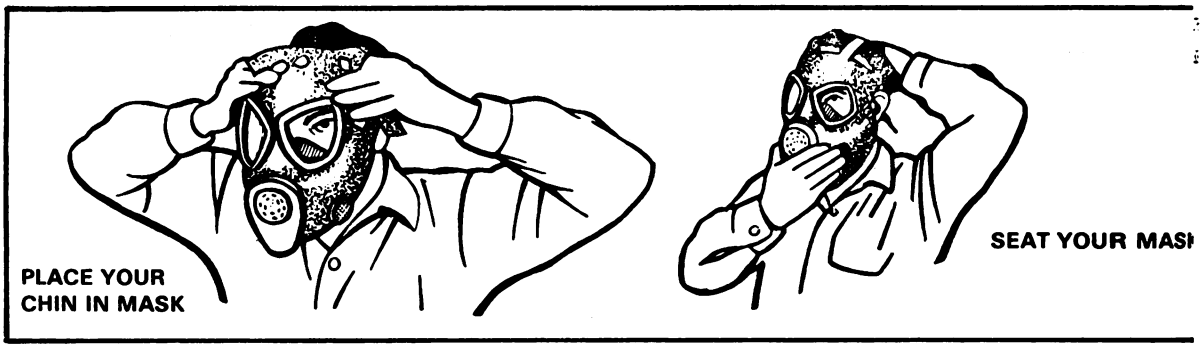

Figure 1.

5. Smooth the edges of the facepiece on the face with an upward and backward motion of the hands, pressing out all bulges to get an airtight seal (figure 2).

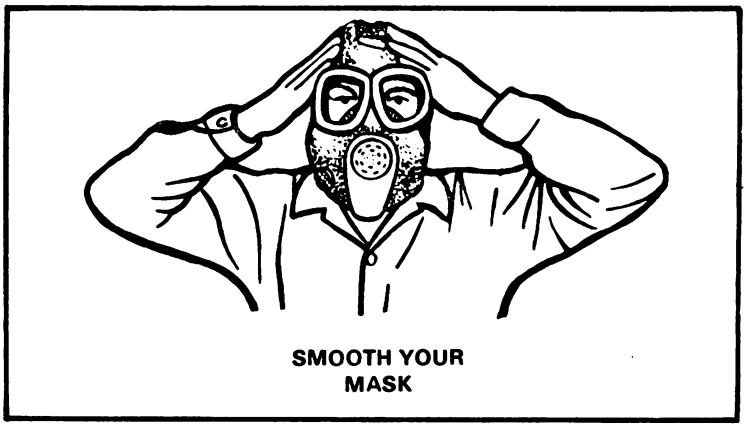

Figure 2.

6. Clear the mask (M17) by placing the palm of one hand over the bottom of the outlet valve cover and blowing hard to clear any agent inside the mask. Clearing the M17A1 also requires covering the voicemitter assembly with the other hand (figure 3).

Figure 3.

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7. Check for leaks by placing the palms of the hands over the two inlet valve assemblies and breathing in slowly for 10 seconds. If there are no leaks, the facepiece will collapse against the face (figure 4).

Figure 4.

8. Secure the protective hood (if present) by pulling the hood over the shoulders, zipping it, and adjusting the drawstrings. Before continuing the mission, pull the straps forward, under the arms, and attach the ends to the velcro patches on the front of the hood.

9. Replace the headgear.

10. Sound the appropriate alarm, and continue the mission.

NOTE TO TRAINERS: This task is designed to familiarize the soldier with the difficulty involved in performing his normal duties while masked. Time should be allowed for the soldier to remain in the mask initially for 1 hour and work up to at least 6 consecutive hours.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, May 17 (app B, sec I, page B-1)
FM 21-41, Individual NBC Defense, Oct 77 (pages 25 thru 27)
TEC Lesson 931-061-0060-F, NBC: The Mask
TEC Lesson 931-061-0061-F, NBC: Masking and When To Do It

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TASK NUMBER: 092-503-1015

PUT ON AND WEAR PROTECTIVE CLOTHING

CONDITIONS:

In a simulated NBC environment, given either the chemical protective overgarment or chemical protective liner ensemble, gloves and socks (boot socks and field gloves may be used), and a requirement to dress in protective clothing.

STANDARDS:

Complete dressing steps in 3 minutes IAW performance measures below.

NOTE TO TRAINERS: this task is designed to familiarize the soldier with the difficulty involved in performing his normal duties while wearing either protective garment. Time should be allowed for the soldier to remain in the protective clothing for a minimum of 6 hours.

PERFORMANCE MEASURES:

1. **Procedure for putting on overgarment.**

   a. Remove boots.

   b. Replace boot socks with impregnated socks.

   c. Put on boots and tuck trouser cuff in boot; lace tightly.

   d. Put on overgarment trousers, zip legs, and tie firm blouse over boots.

   e. Put on overgarment shirt; zip up and fasten closures.

   f. Put on protective gloves and pull the cuff of the overgarment over the gloves.

2. **Procedure for putting on liner ensemble.**

   a. Put on trouser liner.

   b. Put on outer trousers and attach liner waist tie tapes through belt loops of the outer trousers.

   c. Button inside gas flap button of trouser liner into right buttonhole, then button left outside of trouser liner to the same button.

   d. Put on protective socks and pull over top of the knitted cuff of the trouser liner.

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e. Put on boots and lace snugly. The upper portion of the boot must cover the top of the knitted cuff of the trouser liner and top of the sock. The cuff of the outer trousers is bloused over the top of the boot.

f. Put on shirt liner. Button inside gas flap button into right buttonhole, then button left outside of liner to the same button.

g. Tuck the shirttail of the liner inside the trouser liner.

h. Put on the outer shirt. Button, and leave shirttail outside.

i. Put on protective gloves. Pull upper portion of glove over knitted cuff of shirt liner. Sleeves of outer shirt fit over the upper portion of the gloves.

3. **Perform primary duties wearing the protective clothing.**

NOTE: To remove either the overgarment or undergarment, follow steps in para 1 and 2 in reverse order. However, if your overgarment or field uniform and undergarment are contaminated, remove them according to paragraph 4.

4. **When garments are contaminated:**

a. Use the cloth bag from the M13 kit to detect/decontaminate liquid contamination.

b. Loosen the hood and remove the shirt.

c. Remove the trousers.

d. Dust the boots with the cloth bag and wash off with water.

e. Dispose of the contaminated clothing in a container or designated area.

f. Remove the mask and hood (if required, decontamination is done by an assistant prior to removal).

g. Remove the gloves.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71, (chap 4, para 4-2, 4-5, 4-24)

TM 10-277, Protective Clothing Chemical Operations, Jul 67, C1-3, (chap 12, sec III, para 12)

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TASK NUMBER: 092-503-1007

DECONTAMINATE SELF

CONDITIONS:

Given all standard NBC protective equipment, the M13 and M258 decontamination kits or the M58 training skin decontamination kit, and an unknown liquid contaminant on the skin. (Contamination normally would result from exposure to a direct chemical attack or passage through a chemically contaminated area.)

STANDARDS:

Remove all contamination from the skin IAW the performance measures below.

PERFORMANCE MEASURES:

1. If you are not already masked, mask according to task: **Put on and wear a protective mask.**

2. For contamination on your face:

   a. Extract the M13 kit (figure 1) from your protective mask carrier.

   b. Take the fuller's earth pad (skin pad) from the M13 kit.

   c. Grasp the chin portion of your mask and pull the mask away from your face far enough to allow you to touch the fuller's earth pad to your nose.

   d. Make two quick wipes from your nose to each ear and one wipe across the chin.

   e. Replace the mask on your face.

   f. Clear your mask.

   g. Check your mask.

   h. Dispose of the pad.

   i. Put on all protective clothing not already on.

3. For contamination on skin other than the face:

   a. Extract your M258 kit (figure 2) from your protective mask carrier.

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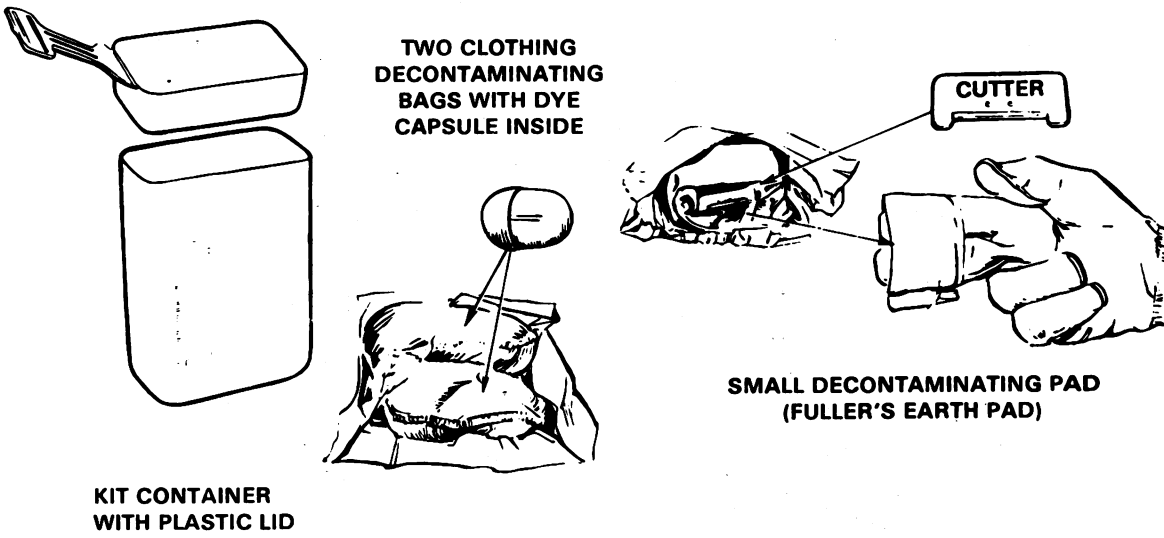
TWO CLOTHING DECONTAMINATING BAGS WITH DYE CAPSULE INSIDE
CUTTER
SMALL DECONTAMINATING PAD (FULLER'S EARTH PAD)
KIT CONTAINER WITH PLASTIC LID

Figure 1. M13 decontamination kit.

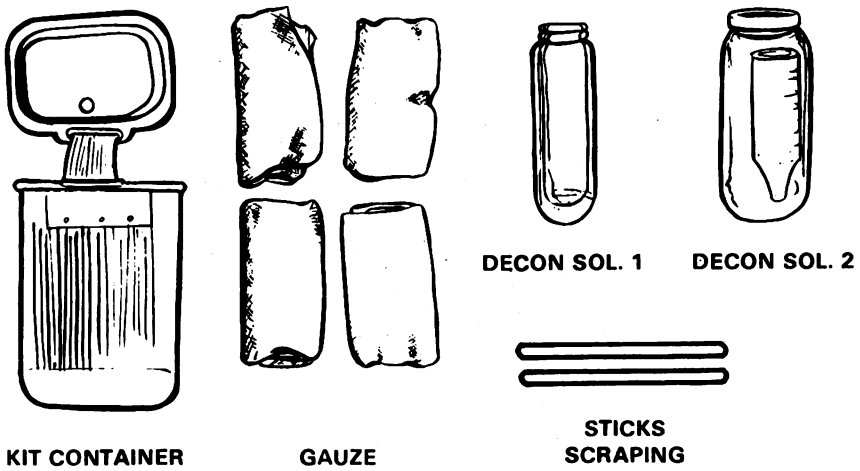

Figure 2. M258 decontamination kit.

b. Open the kit (figure 3) and push the T-handle of the cover through the web strap so that you don't lose it.

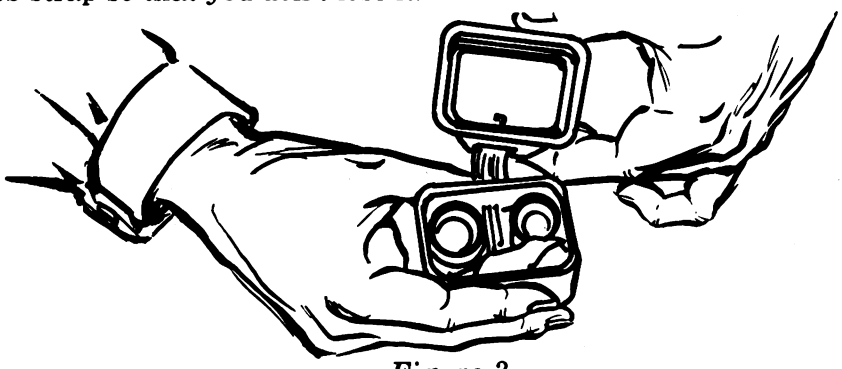

Figure 3.

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c. Take out a piece of gauze and soak up any liquid on your skin. DO NOT WIPE. If the liquid is thick and won't soak into the gauze, use one of the scraping sticks like a spoon to remove it.

d. Take out Capsule 1 and punch a hole in the side near the top of the capsule with the spike attached to the cover of the kit.

e. Wet a gauze pad (figure 4) with the solution from the capsule and blot (figure 5) the contaminated skin.

Figure 4.

Figure 5.

f. Dispose of the pad.

g. Take out Capsule 2 and break the glass vial inside the capsule (figure 6). (Use the heel of your boot, the butt of your rifle, or a rock.)

Figure 6.

h. Shake the capsule hard at least 12 times so that everything is well mixed.

i. Puncture Capsule 2 the same way you did Capsule 1.

j. Wet a gauze pad with the solution from the capsule and blot the contaminated area with the solution; make sure you cover the entire contaminated area.

k. Dispose of the pad.

l. Put on all protective clothing not already on.

SQT ADMINISTRATIVE INSTRUCTIONS: The M58 training kit will be used in all training situations. The M258 kit will be used only for actual chemical agents.

REFERENCES:

FM 21-41, Individual NBC Defense, Oct 77 (page 58 thru 64)

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TASK NUMBER: 092-503-1008

DECONTAMINATE INDIVIDUAL EQUIPMENT

CONDITIONS:

After being exposed to a chemical-agent attack, passing through an area contaminated with an agent, or operating in an area contaminated with a chemical agent, wearing all chemical protective clothing and given an M13 individual decontaminating and reimpregnating kit.

STANDARDS:

Perform decontamination IAW performance measures below.

PERFORMANCE MEASURES:

1. Extract the M13 kit (figure 1) from the protective mask carrier.

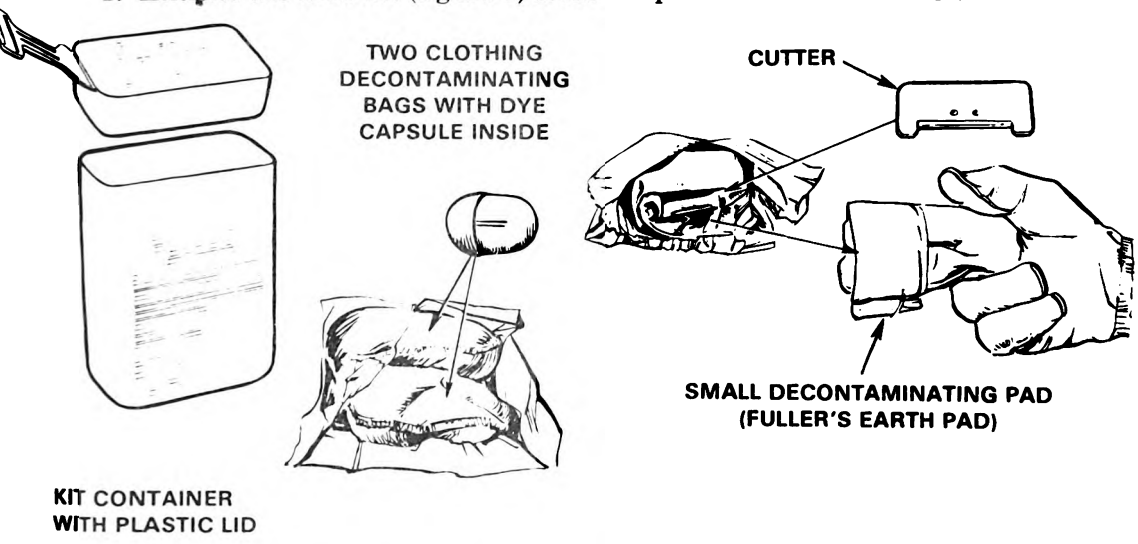
TWO CLOTHING DECONTAMINATING BAGS WITH DYE CAPSULE INSIDE
CUTTER
SMALL DECONTAMINATING PAD (FULLER'S EARTH PAD)
KIT CONTAINER WITH PLASTIC LID

Figure 1. M13 decontamination kit.

2. Remove the fuller's earth pad and, if required, decontaminate the interior surface of your protective mask:

   a. Blot the contamination with one side of the pad.

   b. Turn the pad over.

   c. Slap the pad against the mask to spread the powder.

   d. Rub the powder in using the pad.

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3. Remove the cloth bag and use it to decontaminate the exterior of the mask, clothing, and individual equipment:

a. Crush dye capsule and mix thoroughly inside the bag. **NOTE: DO NOT CRUSH THE DYE CAPSULE UNLESS ACTUAL CONTAMINATION IS PRESENT.**

b. Dust the contaminated area.

c. Inspect for red or brown color on clothing.

d. If red or brown color is present, use the cutter to remove spots larger than one-eighth inch. **NOTE: This does not apply to the overgarment which has an inner liner of charcoal to neutralize the contamination.**

e. On equipment, rub the powder in using the bag.

f. Clean and oil metal equipment.

SQT ADMINISTRATIVE INSTRUCTIONS: That portion of the procedure which requires crushing of the dye capsule will be simulated. Only in the event of an actual chemical contamination will the capsule be crushed.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 4, para 4-2, 4-5, 4-24)
FM 21-41, Individual NBC Defense, Oct 77 (page 65, 66)

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TASK NUMBER: 092-503-1014

IDENTIFY A CHEMICAL AGENT USING ABC-M8 DETECTOR PAPER

CONDITIONS:

In a field or garrison environment, masked and wearing all individual combat equipment, given an unknown liquid chemical agent simulant and sufficient ABC-M8 detector paper.

NOTE TO TRAINER: Contact the NBC NCO at battalion level for suitable agent simulants.

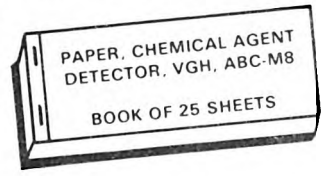
STANDARDS:

Within 1 minute, determine if the chemical agent is nerve (V or G) or blister (H).

PERFORMANCE MEASURES:

1. M8 detector paper gives the individual soldier the means for determining the presence of nerve or blister (H-type only) agents. M8 detector paper alone does not allow the soldier to determine if he can unmask. It will only detect nerve and blister agents in liquid form and must physically come in contact with them. M8 detector paper is normally found in the protective mask carrier.

M8 DETECTOR PAPER



2. To use M8 paper:

a. Remove the book of detector paper from the wrapping.

b. Tear out one sheet of paper.

c. Touch the paper to the suspected agent.

d. Try to match the color reaction on the paper to the color chart on the inside cover of the book.

3. Inform your supervisor of your findings. Continue to wear your mask even if you don't get a match as this is no indication that the substance is necessarily safe.

REFERENCE:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 8, page 8-12, para 8-17a)

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TASK NUMBER: 092-503-1006

DEMONSTRATE VISUAL, VOCAL, AND SOUND ALARMS FOR AN NBC ATTACK

CONDITIONS:

In a field environment, masked and wearing all individual combat equipment, given a requirement to give the alarm for a surprise NBC attack.

STANDARDS:

Demonstrate the correct arm-and-hand signal, vocal signal, and sound alarm in accordance with performance measures below.

PERFORMANCE MEASURES:

1. **Visual Signal** (figure 1). Extend both arms horizontally sideways with fists doubled facing up, and rapidly move the fists to the head and back to the horizontal position. Repeat at least three times.

Figure 1.

2. **Vocal Signal.** Yell "Spray!" for a chemical or biological spray attack and "Gas!" for an attack by any other means.

3. **Sound Alarm.**

a. Rapidly strike metal on metal to produce a loud clanging noise.

b. Soldiers should become familiar with the sound alarm given off by the automatic chemical agent alarm. This sound is very similar to a police siren.

NOTE TO TRAINERS: It is recommended that this task be trained in conjunction with unit NBC training on field exercises.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 4, sec II, para 4-9; app G)
FM 21-60, Visual Signals, Dec 74 (chap 2, page 2-1)

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TASK NUMBER: 092-503-1009

SATISFY PERSONAL NEEDS IN A CHEMICAL ENVIRONMENT

CONDITIONS:

In an area contaminated with an unknown chemical agent (simulated), masked and wearing standard chemical protective clothing (or acceptable substitute) and all individual combat equipment, given the need to drink water, use the latrine, and sleep.*

***NOTE: Other personal needs such as eating, shaving, bathing, and changing clothes in a chemical environment require equipment and efforts beyond the capabilities of an individual. Your unit will tell you how to deal with these problems.**

STANDARDS:

1. Drink water from your canteen IAW performance measures below.
2. Explain correct procedure for defecating, urinating, and sleeping.

PERFORMANCE MEASURES:

1. Drinking with mask other than the M17A1.

a. Remove the canteen from the carrier, remove the canteen cap and, if necessary, decontaminate exposed threads with water or the skin pad from the M13 decontaminating kit.

b. Take a few breaths and hold the last one.

c. Close the eyes, pull the protective hood up, grasp facepiece behind the outlet valve assembly of the protective mask with the free hand, and pull the facepiece out and up far enough to provide access to the mouth.

d. Place the neck of the canteen to the closed lips and cant it, tilting the head back until the water reaches the lips, and then fill the mouth with water.

e. Replace the facepiece, swallow the water, and then clear the mask.

f. Rest and then repeat as necessary.

2. Drinking when wearing the M17A1 mask (figure 1).

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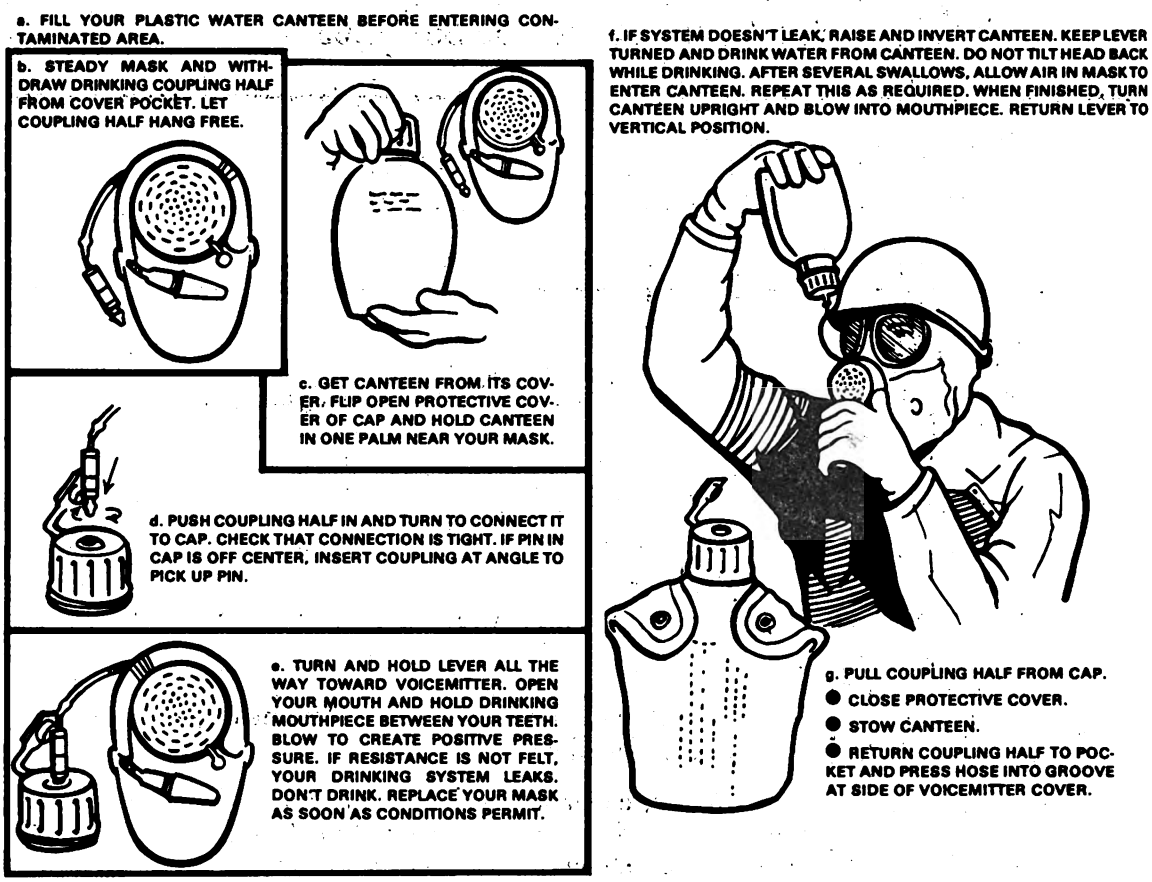
a. FILL YOUR PLASTIC WATER CANTEEN BEFORE ENTERING CONTAMINATED AREA.
b. STEADY MASK AND WITHDRAW DRINKING COUPLING HALF FROM COVER POCKET. LET COUPLING HALF HANG FREE.
c. GET CANTEEN FROM ITS COVER. FLIP OPEN PROTECTIVE COVER OF CAP AND HOLD CANTEEN IN ONE PALM NEAR YOUR MASK.
d. PUSH COUPLING HALF IN AND TURN TO CONNECT IT TO CAP. CHECK THAT CONNECTION IS TIGHT. IF PIN IN CAP IS OFF CENTER, INSERT COUPLING AT ANGLE TO PICK UP PIN.
e. TURN AND HOLD LEVER ALL THE WAY TOWARD VOICEMITTER. OPEN YOUR MOUTH AND HOLD DRINKING MOUTHPIECE BETWEEN YOUR TEETH. BLOW TO CREATE POSITIVE PRESSURE. IF RESISTANCE IS NOT FELT, YOUR DRINKING SYSTEM LEAKS. DON'T DRINK. REPLACE YOUR MASK AS SOON AS CONDITIONS PERMIT.
f. IF SYSTEM DOESN'T LEAK, RAISE AND INVERT CANTEEN. KEEP LEVER TURNED AND DRINK WATER FROM CANTEEN. DO NOT TILT HEAD BACK WHILE DRINKING. AFTER SEVERAL SWALLOWS, ALLOW AIR IN MASK TO ENTER CANTEEN. REPEAT THIS AS REQUIRED. WHEN FINISHED, TURN CANTEEN UPRIGHT AND BLOW INTO MOUTHPIECE. RETURN LEVER TO VERTICAL POSITION.
g. PULL COUPLING HALF FROM CAP.
● CLOSE PROTECTIVE COVER.
● STOW CANTEEN.
● RETURN COUPLING HALF TO POCKET AND PRESS HOSE INTO GROOVE AT SIDE OF VOICEMITTER COVER.

Figure 1.

3. Defecating and urinating. During the removal, opening, and closing of contaminated outergarments or while squatting over the latrine in a contaminated environment, the possibility of transferring contamination to the underclothing or exposed skin requires special precautions. For this reason, individuals dust with the cloth pad of the M13 decontamination kit the parts of the contaminated outergarments that might come in contact with the skin when the contaminated clothing is partially removed or opened. After the contaminated outergarments have been opened or partially removed, individuals remove the protective gloves before handling undergarments or the bare skin.

4. Sleeping.

a. Wear all protective clothing, mask, and hood.

b. Use the "buddy" system to periodically check to insure the clothing, mask, and hood do not become dislodged while sleeping.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 4, page 4-16 thru 4-17, para 4-26 thru 4-30)
TM 3-4240-279-10, Operator's Manual, ABC M17/M17A1, C1, Aug 75 (chap 2, pages 2-13 thru 2-14)

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TASK NUMBER: 092-503-1005

PROTECT SELF AGAINST A NUCLEAR HAZARD

CONDITIONS:

In a field or garrison location, wearing all individual combat gear, given a sudden nuclear explosion (simulated) without warning.

STANDARDS:

Protect yourself IAW performance measures listed below.

PERFORMANCE MEASURES:

1. When subjected to an unexpected nuclear attack:

a. Close your eyes and fall face down to the ground immediately, your head in the direction opposite the blast.

b. As you hit the ground, cover all exposed skin. Place your hands under your body, keep your face down in the dirt, and hunch your shoulders forward to try to cover the back of your neck. Be sure to keep your helmet on.

c. Remain down until the blast wave passes over you, first in one direction and then in the opposite direction, and until debris stops falling.

d. Stay calm, check for injury, check weapons and equipment damage, and prepare to continue the mission.

2. The important thing to remember in an unexpected nuclear attack is to take cover immediately. That means if you have a choice between falling directly on the ground or taking two steps and jumping into a ditch, you must fall directly on the ground. In the time it takes to go those two extra steps, you can sustain serious injury.

3. When warned of an imminent nuclear attack, place yourself in the best protective position possible (figure 1).

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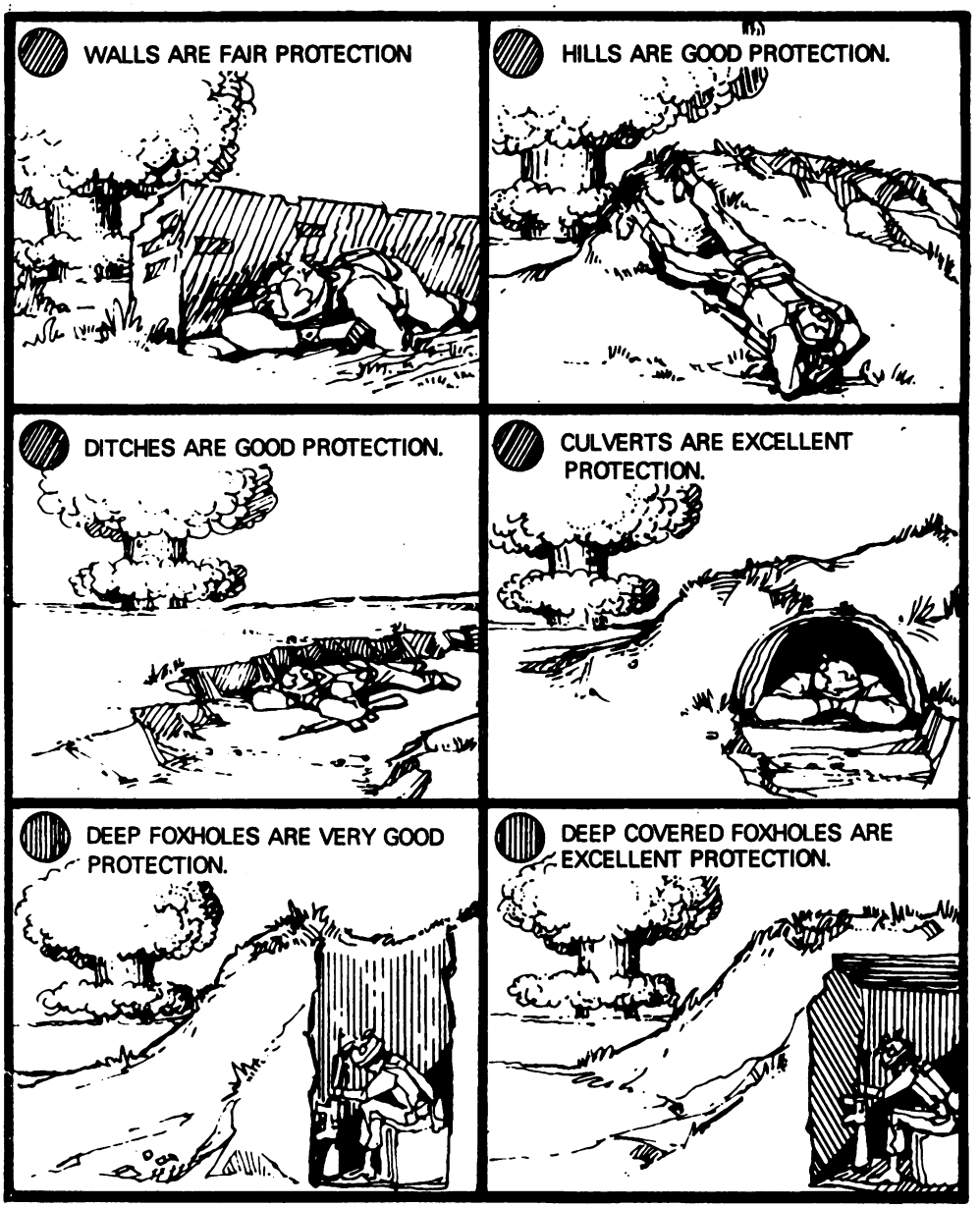
WALLS ARE FAIR PROTECTION
HILLS ARE GOOD PROTECTION.
DITCHES ARE GOOD PROTECTION.
CULVERTS ARE EXCELLENT PROTECTION.
DEEP FOXHOLES ARE VERY GOOD PROTECTION.
DEEP COVERED FOXHOLES ARE EXCELLENT PROTECTION.

Figure 1.

NOTE: An armored vehicle is excellent protection.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 6, page 6-1, para 6-1 thru 6-5; app F, page F-1)
TEC Lesson 931-061-0064-F, Individual Protection and Decontamination

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TASK NUMBER: 081-831-1012

ADMINISTER ANTIDOTE TO A NERVE-AGENT CASUALTY

CONDITIONS:

While wearing a protective mask, given a training automatic injector and a casualty with nerve-agent symptoms (described or simulated) (casualty may be tested soldier).

STANDARDS:

Within 10 seconds, recognize nerve-agent symptoms, inject casualty (self) with antidote (simulated), and massage injection area.

PERFORMANCE MEASURES:

1. Recognize symptoms of nerve-agent poisoning: flushed skin with local sweating and tremors, or tightness of chest and pin-pointing of pupils of the eye (tested soldier would recognize this as dimness of vision).

2. Mask the casualty if not already masked.

3. Remove yellow or gray safety cap from the Combo Pin injector.

4. Place green or black end of injector against casualty's thigh (or other large muscle), push until injector functions, and hold firm for a full 10 seconds.

5. Massage the injection area.

6. Attach expended injector to casualty's shirt collar by bending needle through material.

7. Repeat **steps 3, 4, 5,** and **6** after a 5 minute interval if necessary.

NOTE: Administer no more than two Combo Pin injections. This applies to the new antidote as opposed to atropine.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 11, page 129)
FM 21-40, Chemical Biological, Radiological, and Nuclear Defense, May 71 (chap 4, sec III, pages 4 thru 13)
FM 21-41, Individual NBC Defense, Oct 77 (page 32)

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TASK NUMBER: 081-831-1017

ADMINISTER ANTIDOTE TO BLOOD-AGENT CASUALTY

CONDITIONS:

In a simulated NBC environment, wearing all individual equipment, gloves, and mask, given at least two simulated amyl nitrite capsules and a casulaty showing symptoms of blood-agent poisoning.

STANDARDS:

Within 30 seconds, recognize blood-agent symptoms, and administer antidote IAW performance measures below.

PERFORMANCE MEASURES:

1. How to recognize blood-agent poisoning: marked increase or decrease in breathing rate (labored), convulsions or coma.

2. Mask the casualty.

3. Insert a crushed amyl nitrite capsule (simulated) inside protective mask.

4. Repeat **step 3** every 4 minutes until normal breathing returns, or a total of eight amyl nitrite capsules is used.

5. Administer artificial respiration, as necessary.

6. Prepare to continue mission.

NOTE: If casualty cannot be masked for some reason, hold amyl nitrite capsule directly under casualty's nose. Be sure to use the casualty's amyl nitrite capsule and not your own.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 11, page 135)
FM 21-41, Individual NBC Defense, Oct 77 (page 35)
TEC Lesson 931-061-0062-F, NBC: First Aid, Part 1

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TASK NUMBER: 081-831-1009

APPLY ARTIFICIAL RESPIRATION TO A CHEMICAL-AGENT CASUALTY

CONDITIONS:

During daylight or darkness, in a contaminated area, wearing a field protective mask with M1 resuscitation tube, given an unconscious chemical-agent casualty (a dummy may be used for training).

STANDARDS:

1. Clear the casualty's upper air passage.

2. Apply artificial respiration until the casualty begins to resist resuscitation.

3. Mask the casualty.

PERFORMANCE MEASURES:

Use of M1 resuscitation tube.

1. Place the casualty on his back. Stretch the front of the neck by lifting up on his chin with one hand; push the back of his head down as far as it will go with the other hand.

2. While holding the casualty's chin up, open his mouth and remove loose dentures (if any). Insert a finger and clean out any foreign matter or mucus that may be in his mouth.

3. Insert the resuscitation mouthpiece between the casualty's lips and teeth. Completely surround the edge of the mouthpiece with his lips.

4. Hold the mouthpiece in place by putting your thumb and index finger over the outside of the casualty's lips and hooking remaining fingers under his chin (figure 1).

5. Pinch the casualty's nostrils closed. Take a deep breath and blow into the breathing tube mouthpiece until the casualty's chest appears to rise. Relax the pressure on the casualty's nostrils and allow him to exhale. Repeat this procedure at a rate of approximately 12 times a minute until the casualty is able to breathe for himself.

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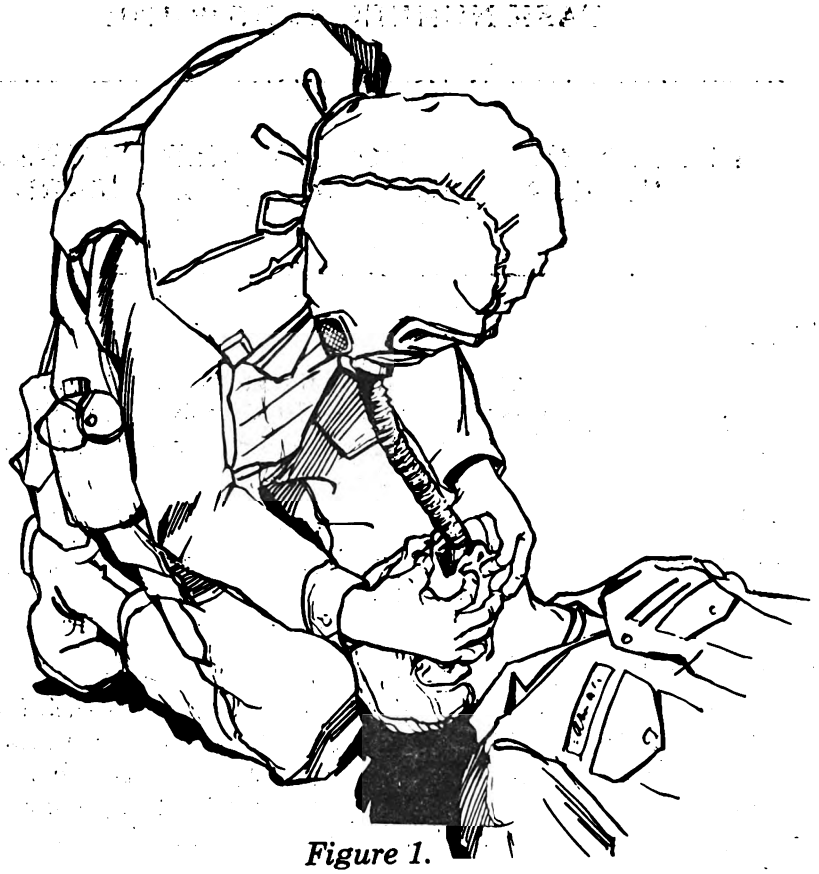

Figure 1.

NOTE: When a casualty begins to breathe for himself, he will automatically resist resuscitation efforts.

6. When the casualty can breathe normally, have him hold his breath for masking.

7. Remove the resuscitation mouthpiece from the casualty's mouth and put a mask on his face.

8. Remove the resuscitation tube from your mask. Wipe the resuscitation mouthpiece as clean as possible and wash it as soon as conditions permit.

REFERENCES:

FM 21-11, First Aid for Soldiers, Jun 76 (chap 11, pages 130-134)
TM 3-4240-279-10, Mask, Chemical-Biological Field, M17A1 and M17 and Accessories, Aug 75 (chap 2, pages 2-18 to 2-21)
TEC Lesson 931-061-0063-F, NBC: First Aid, Part 2

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TASK NUMBER: 092-503-1004

RECOGNIZE AND PROTECT SELF AGAINST A CHEMICAL/BIOLOGICAL (CB) HAZARD

CONDITIONS:

In a field environment during the conduct of a tactical mission against (simulated) enemy forces which have a CB offensive capability, given your assigned weapon, TOE equipment, and protective mask with all accesories.

STANDARDS:

Respond to source or indicator of NBC attack by masking, sounding the alarm, and continuing the mission.

PERFORMANCE MEASURES:

1. Current analysis of threat doctrine indicates that threat forces have a powerful CB offensive capability and are prepared to use it. Its important, then, for the individual soldier to know what the possible sources and indicators of a CB attack are. He must learn to mask immediately when these sources or indicators become apparent to him, if he is to survive on the battlefield.

2. If an attack is reported to be imminent or if chemical agents have been used already by enemy forces, individuals not already masked will mask when:

a. Any artillery, mortar, rocket, or aircraft attack occurs on or near their position.

b. Any smoke, mist, vapor, or droplets of an unknown source occur in the area.

c. There is any reason for suspecting a chemical attack.

d. Any of the following symptoms appear:

(1) Running nose.

(2) Choking and/or tightness in the chest and throat.

(3) Dimming of vision or difficulty in focusing.

(4) Irritation of the eyes.

(5) Increase in breathing rate, or difficulty in breathing.

e. Entering an area known or suspected to be contaminated.

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3. In some cases, you will encounter a contaminated area which has been marked. You should mask immediately. Standard NATO CB markers are pictured in figure 1.

a. The chemical marker has the word GAS in red against a yellow background.

b. The biological marker has the word BIO in red against a blue background.

c. The chemical minefield marker has the words GAS MINES and a horizontal strip in yellow on a red background.

NOTE: The front surface of the marker is facing away from the contaminated area and all information concerning the minefield is placed on the front surface of the marker, not the back.

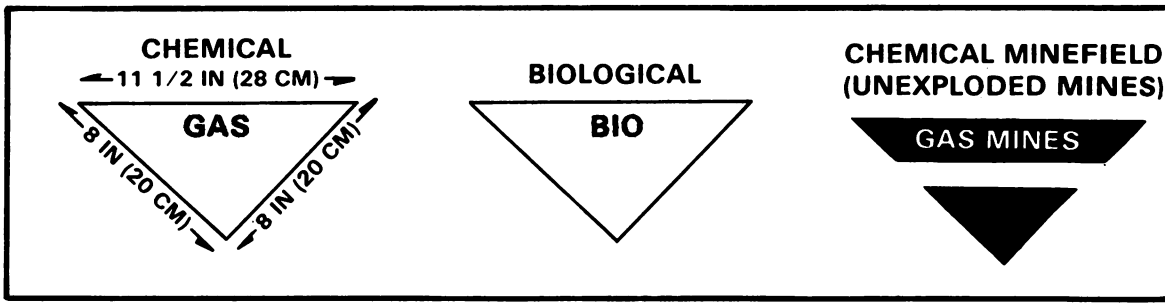

Figure 1.

SQT Administrative Instruction: An on-target chemical agent attack can be simulated using the Simulator Projectile Airburst Liquid (SPAL) M9 or a spray of water combined with the detonation of artillery simulators.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 2, para 2-14/21/22/27; chap 4, para 4-10; app F, page F-1)
FM 21-41, Individual NBC Defense, Oct 77 (page 7, 8, 13 thru 17)

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TASK NUMBER: 092-503-2002

DECONTAMINATE EQUIPMENT USING ABC-M11 DECONTAMINATION APPARATUS

CONDITIONS:

In a simulated NBC environment, while masked and wearing all individual combat equipment and gloves, given a prefilled ABC-M11 decontamination apparatus and a contaminated (simulated) weapon.

STANDARDS:

Place the M11 decontamination apparatus into operation and decontaminate the weapon.

PERFORMANCE MEASURES:

NOTE TO TRAINERS: Fill the M11 with water instead of DS2 for training purposes. When task is complete, thoroughly dry the M11 to prevent rusting, and heavily oil the weapon to prevent it from rusting.

1. The M11 decontamination apparatus (figure 1) has a 1½-quart capacity and normally holds 1-1/3 quarts of DS2 decontamination solution. It is normally mounted in wheeled and tracked vehicles, to be used to decontaminate surfaces which must be handled to operate the vehicle or allow it to perform its mission (e.g., laterals, steering wheel, driver's seat, combat door, hatches, etc.).

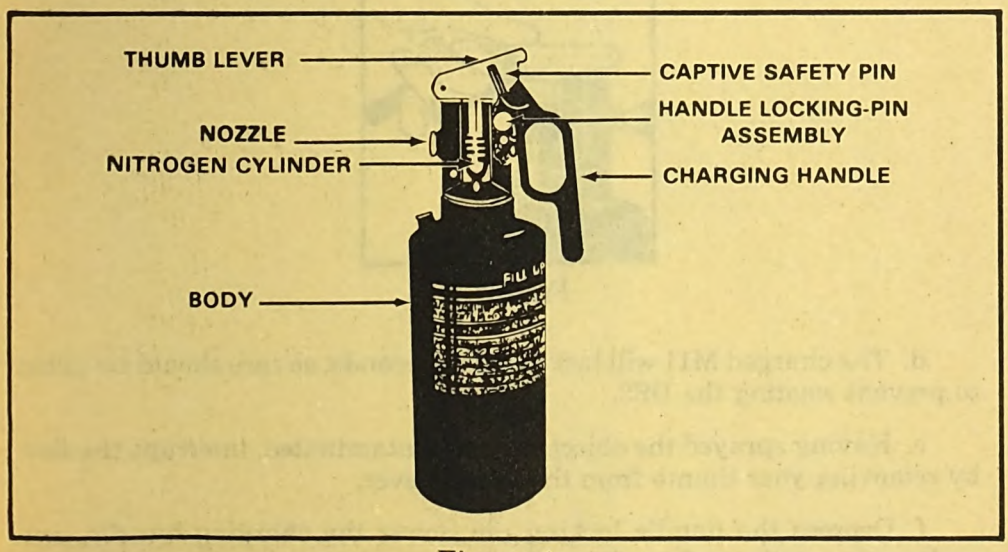

Figure 1.

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2. To operate a filled M11:

a. Remove the captive safety pin.

b. Grasp the M11 in one hand (figure 2) and lift up on the charging handle with the other. You should hear a hissing noise which indicates the compressed gas from the nitrogen cylinder has entered and charged the M11.

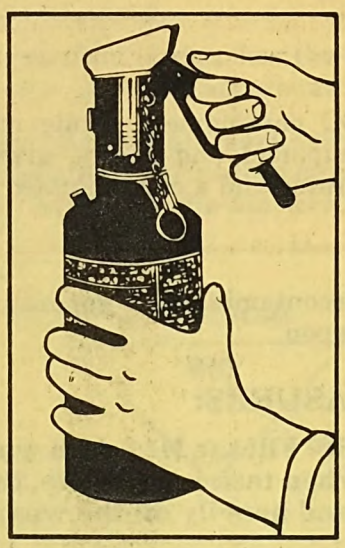

Figure 2.

c. Pull up on the charging handle, point the apparatus at the object to be decontaminated, hold it 6 to 8 inches away, and depress the thumb lever (figure 3).

Figure 3.

d. The charged M11 will last about 30 seconds, so care should be taken to prevent wasting the DS2.

e. Having sprayed the object to be decontaminated, interrupt the flow by removing your thumb from the thumb lever.

f. Depress the handle locking pin, lower the charging handle, and replace the captive safety pin.

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WARNING: DS2 is highly corrosive. DO NOT SPRAY ON PERSONNEL and avoid spraying fabric.

3. To decontaminate a contaminated weapon.

NOTE: For training, the M11 can be filled with water. Care should be taken to dry it out thoroughly when finished to avoid rusting.

a. Holding the charged and filled M11 6 to 8 inches from the weapon, depress the thumb lever and cover the weapon completely with the spray from the apparatus. Avoid getting spray on any surfaces that are not metal.

b. Wait 30 minutes (simulate).

c. Flush surfaces of weapon with water, taking care to avoid contact with the runoff.

d. Dry, clean, and lubricate weapon.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71 (chap 4, para 4-25)
TM 3-4230-204-13, Decontaminating Apparatus, Portable, DS2, 1½ Quart ABC-M11, Oct 69 (chap 2, para 2-3 thru 2-4)

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TASK NUMBER: 092-503-2007

IGNITE SMOKE POTS

CONDITIONS:

In a (simulated) combat environment given an M1 or M5 smoke pot and a requirement to conceal your position.

STANDARDS:

Ignite the M1 or M5 smoke pot.

PERFORMANCE MEASURES:

1. To ignite the M1 pot (figure 1).

   a. Strip off the adhesive tape and clamp.

   b. Remove outer cover to expose match head.

   c. Remove scratcher block from envelope.

   d. While looking away from the pot, draw the scratcher block rapidly across the match head.

   e. Move away from the smoke pot.

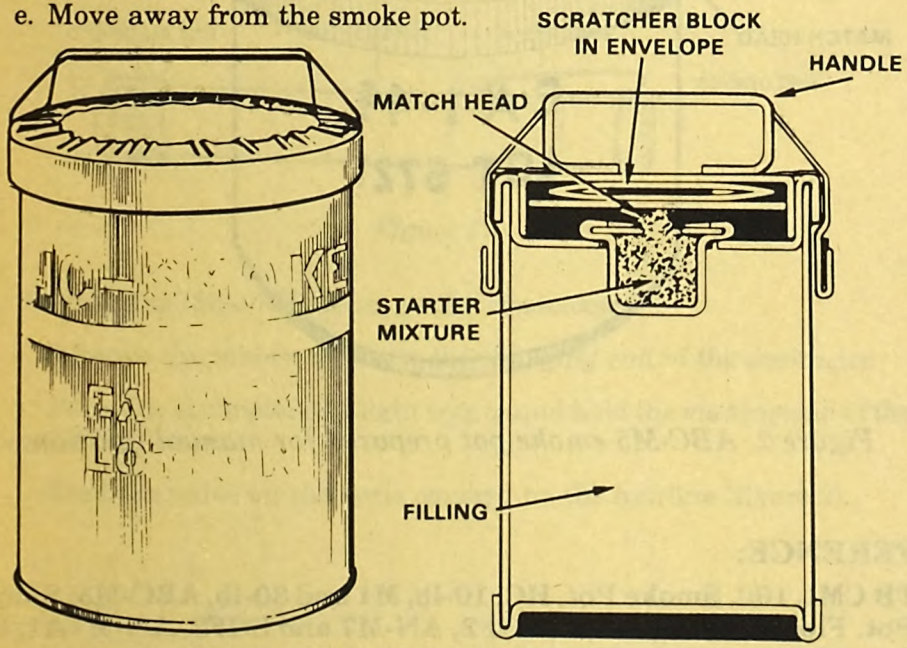

Figure 1. M1 10-lb. HC smoke pot.

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2. To ignite the M5 pot (figure 2).

a. Expose the match head by pulling the tear strip handle upward and off.

b. Remove scratcher block from envelope.

c. While looking away from the pot, draw the scratcher block rapidly across the match head.

d. Move away from the smoke pot.

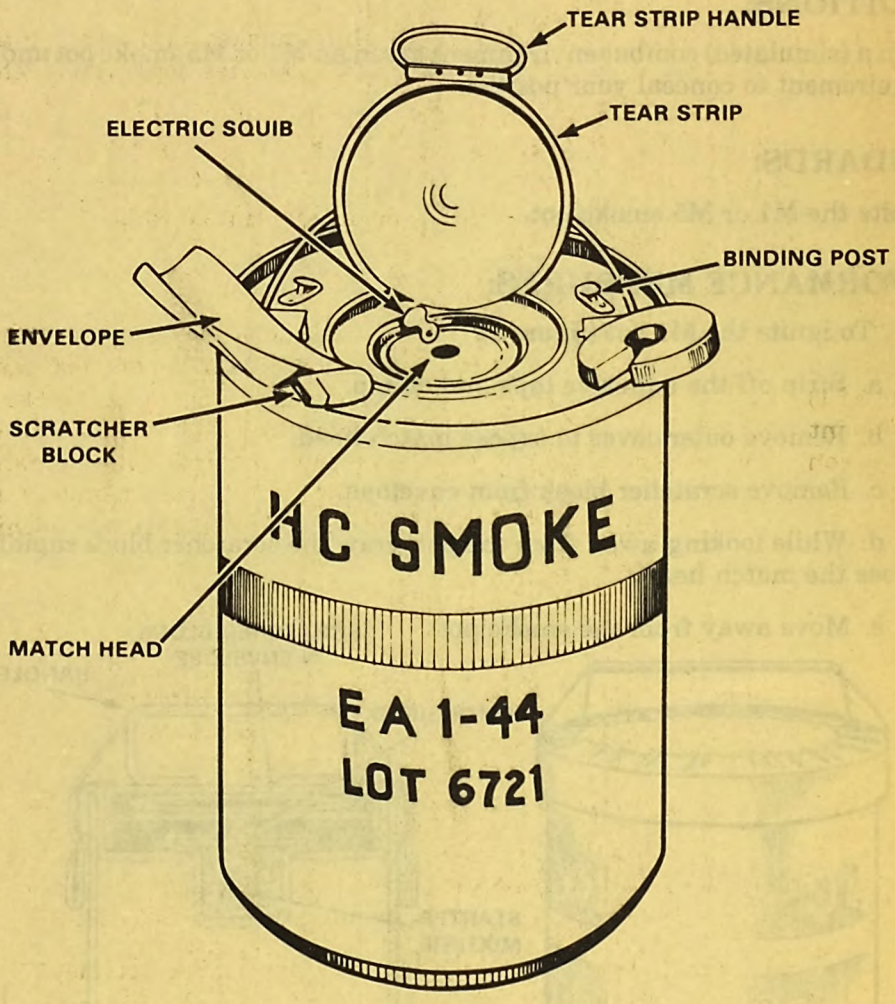

Figure 2. ABC-M5 smoke pot prepared for manual ignition.

REFERENCE:

TB CML 100, Smoke Pot, HC, 10-lb, M1 and 30-lb, ABC-M5; Smoke Pot, Floating, HC, M4A2; SGF2, AN-M7 and SGF2, AN-M7A1, C1, Apr 64 (para 8-b(1); 9b(1))

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TASK NUMBER: 092-503-2001

READ AND REPORT RADIATION DOSAGES

CONDITIONS:

In a nuclear environment (simulated) while masked and wearing all individual combat equipment, given an IM93/UD series pocket dosimeter with a preset radiation dosage.

STANDARDS:

Read and report the correct radiation dosage within 20 rads.

PERFORMANCE MEASURES:

1. The IM93/UD and IM93A/UD are total-dose pocket dosimeters capable of indicating total exposure to radiation on a scale of 0-600 rads (figure 1). The IM93/UD series dosimeter is designed to be carried like a ballpoint pen, and will allow the soldier to determine the total amount of radiation he has been exposed to over a given period of time. It is normally distributed to a representative number of squad or platoon members, to allow the commander to determine the average radiation exposure within the entire unit.

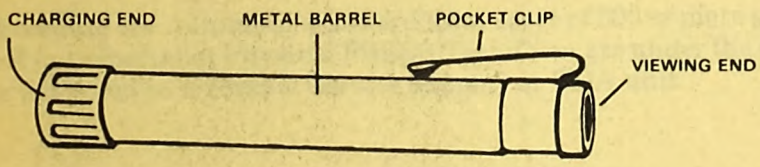

Figure 1.

2. To read the IM93/UD series pocket dosimeter:

a. Remove the rubber cap from the charging end of the dosimeter.

b. Point the dosimeter at a light source and hold the viewing end of the dosimeter to the eye.

c. Read the value on the scale covered by the hairline (figure 2).

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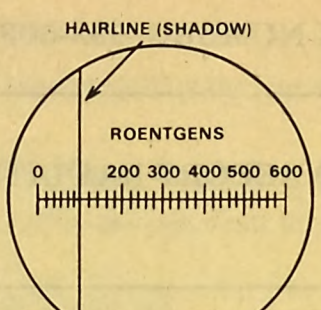

Figure 2.

d. Report the total number of rads indicated to your supervisor.

REFERENCES:

FM 21-40, Chemical, Biological, Radiological, and Nuclear Defense, C1, May 71, (chap 11, pages 11-3 thru 11-5, para 11-6)

TM 11-6665-214-10, Operator's Manual: Radiacmeters IM93/PD, IM93/UD, IM93a/UD, and IM-147/PD, C1-3, Nov 62 (chap 4, page 20)

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TASK NUMBER: 071-327-0201

MAINTAIN AN APPROPRIATE LEVEL OF PHYSICAL FITNESS (MALE ONLY)

CONDITIONS:

You will be tested to measure your physical fitness. If you are assigned to a combat or combat support unit, you will be given the Advanced Physical Fitness Test. If you are assigned to a combat service support unit or a TDA organization, you will be given the Staff and Specialist Physical Fitness Test. This test will be in daylight at a site established for the physical fitness test appropriate to your unit.

STANDARDS:

You must demonstrate, once every 6 months, that you can meet or exceed the minimum level of physical fitness required of each member of your unit in accordance with the standards contained in AR 600-9 by:

1. Exceeding the minimum standard score of 60 points on each test event with a total score of 300 or more points on the Advanced Physical Fitness Test if you are under the age of 40 and are assigned to a combat or combat support unit.

2. Exceeding the minimum standard total score of 300 or more points on the Staff and Specialist Physical Fitness Test if you are under the age of 40 and are assigned to a combat service support or TDA unit.

PERFORMANCE MEASURES:

1. Complete the five events of the Advanced Physical Fitness Test (APFT) listed below, as outlined in FM 21-20.

   a. Inverted crawl.

   b. Run, dodge, and jump.

   c. Horizontal ladder.

   d. Bent-leg situps.

   e. Two-mile run.

2. Personnel over the age of 40 may elect not to take the APFT. If they elect to take it, they must complete the test once they have begun the first event or else they will receive a NO GO for the entire test.

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3. Complete the five events of the Staff and Specialist Physical Fitness Test listed below, as outlined in FM 21-20.

a. Pushups.

b. Run, dodge, and jump.

c. Horizontal ladder.

d. Bent-leg situps.

e. One-mile run.

SQT REQUIREMENTS:

1. Failure to meet the standards for either test will result in an evaluation of NO GO. Personnel with profiles, who cannot complete all five events of either test, will be scored as nonobserved on the performance certification portion of the SQT.

2. SQT credit will be awarded as follows:

EVALUATION	SQT POINTS
NO GO	0
GO	1
NONOBSERVED	Neither counts for nor against total SQT score

REFERENCES:

AR 600-9, Army Physical Fitness Program and Weight Control Program, Nov 76 (chap 2, pages 2-1 thru 2-2, para 2-1 thru 2-6)
FM 21-20, Physical Readiness Training, C3, Mar 73 (chap 24-26, pages 211-253, para 386-424)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION II
COMBAT TECHNIQUES

TASK SUMMARIES

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2. **To camouflage exposed skin** (figure 2):

a. Paint the shiny areas (forehead, cheekbones, nose, and chin) with a dark color.

b. Paint the shadow areas (around the eyes, under the nose, and under the chin) with a light color.

c. Paint the exposed skin on the back of your neck and hands with irregular patterns.

d. When applying camouflage, use the buddy system – work with another man and check each other.

Figure 2.

(1) Slits in burlap allow insertion of natural material.

(2) Rubber bands, or expedient bands made from old inner tubes or burlap strips, secure natural materials. (Note position of band.)

(3) A disruptive paint pattern, with the pattern carried across the curved lines of the edges, especially those seen from the front.

Figure 3.

3. **To camouflage the helmet** (figure 3):

a. The outline of the helmet is one of the striking features of your equipment, and its curved shape can be easily identified by the enemy. You should attempt to break up the outline of your helmet. There are several ways of doing this. Figure 3 shows some examples.

b. Improvised helmet covers can be made of pieces of burlap, other cloth, or sandbags.

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Figure 5.

REFERENCES:

FM 5-20, Camouflage, May 68 (chap 4, pages 26 thru 30, para 11 thru 17)
TEC Lesson 937-061-0030-F, Cover, Camouflage, and Concealment, Part I

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TASK NUMBER: 051-202-1002

CAMOUFLAGE/CONCEAL EQUIPMENT

CONDITIONS:

During daylight, given an item(s) of military equipment in a field location, natural camouflage materials (foliage, grass, mud, snow, etc.) appropriate to area, camouflage net(s), and basic issue pioneer equipment.

STANDARDS:

Conceal shiny parts and cover remaining areas of the equipment in irregular patterns, and alter outlines to blend with the predominant terrain background pattern in the area.

PERFORMANCE MEASURES:

To camouflage and conceal equipment, follow these examples:

1. Use pattern paint, mud, etc., to cover shiny areas of equipment in irregular patterns so the item will blend with the color of natural surroundings (figure 1).

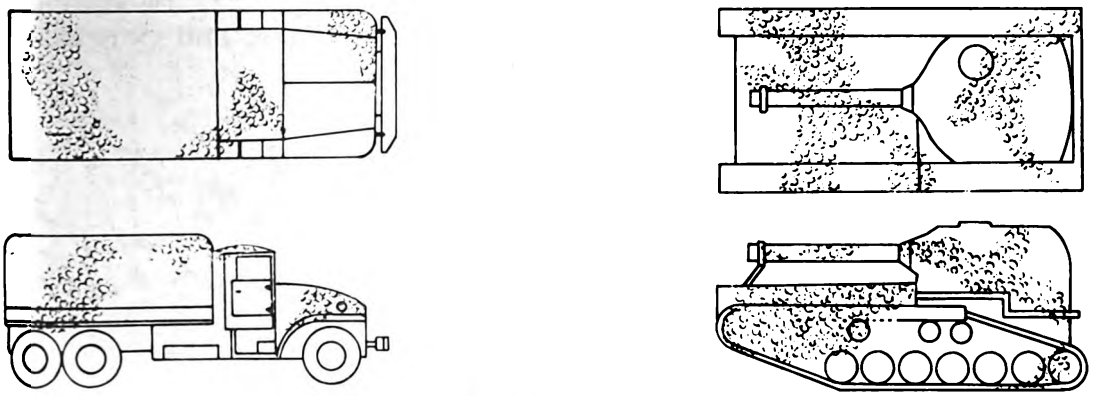

Figure 1.

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2. Use natural materials (foliage, grass, mud, etc.) and manmade materials to alter the shape and size of the equipment (figure 2).

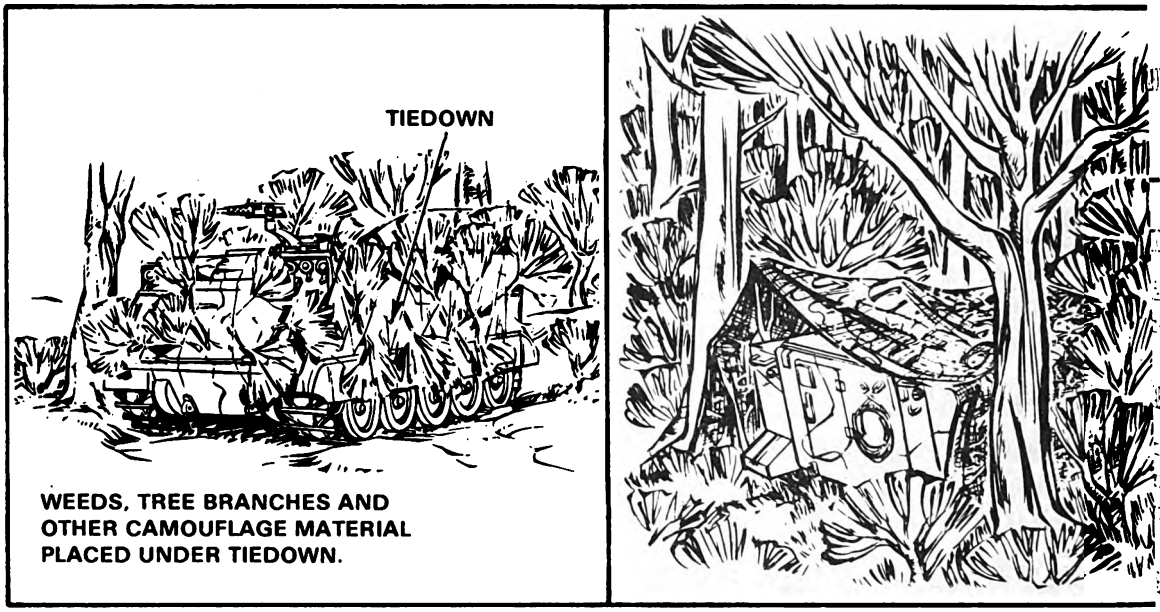

Figure 2.

REFERENCES:

FM 5-20, Camouflage, May 68 (pages 31 — 48)
FM 7-7, The Mechanized Infantry Platoon and Squad, Sep 77 (pages 9-1 — 9-12)
FM 7-8, The Infantry Platoon and Squad (TBP)
TEC Lesson 937-061-0030-F, Cover, Camouflage, and Concealment, Part I

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c. Do not disturb vegetation not used in constructing or camouflaging the position. Be particularly careful with a vehicle, if you are a driver, to insure that the vehicle does not leave a trail pointing out the position (figure 2).

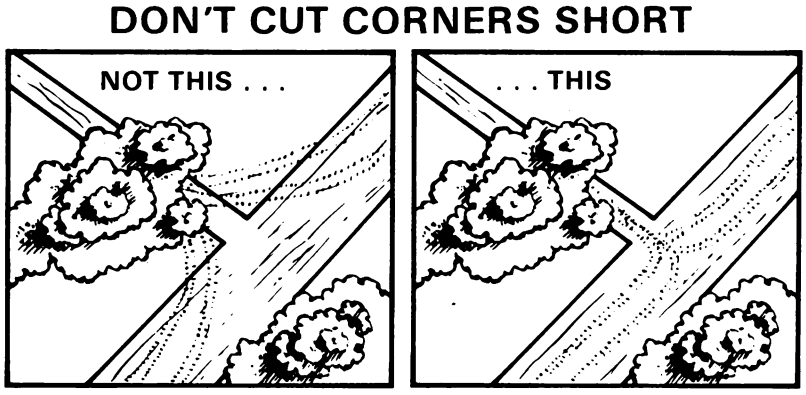

Figure 2.

2. During construction:

a. Place sod from the position in front of proposed parapet location.

b. Use soil removed from the position to build a parapet and then cover it with sod in such a manner that it looks natural and will have a good chance of growing. Conceal the dirt you dig from the foxhole by carrying it away and putting it under low bushes, on roads, or in streams and ponds (figure 3). The poncho is handy for carrying soil.

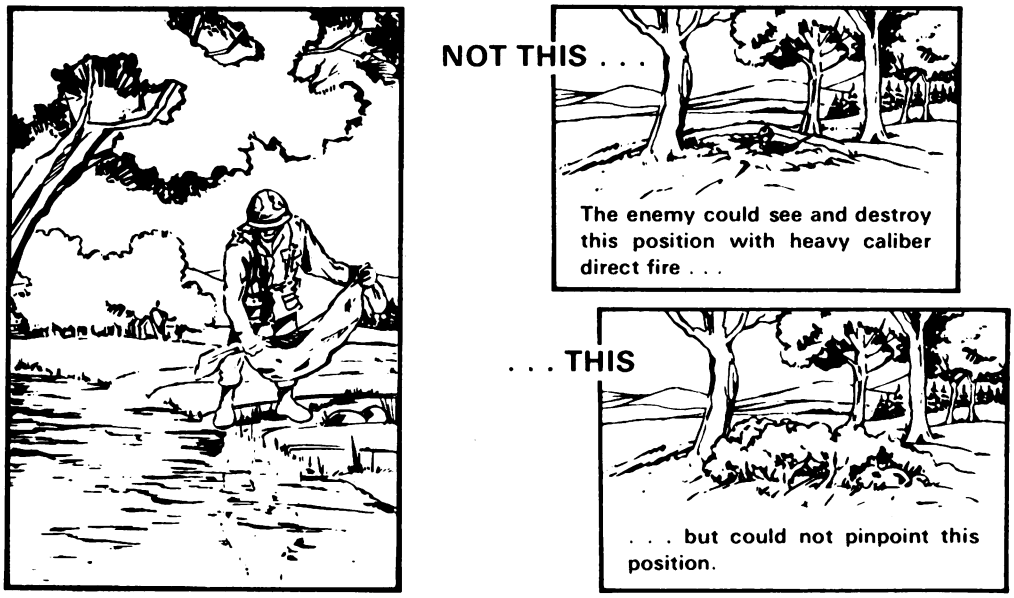
NOT THIS . . .
The enemy could see and destroy this position with heavy caliber direct fire . . .
. . . THIS
. . . but could not pinpoint this position.

Figure 3.

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c. If additional vegetation must be used to break up the outline of the parapet, obtain some (similar to that found near your position) from far to the rear of your position with root structure intact, if possible. Do not use so much vegetation that the position has more than the surrounding area. Camouflage the holes or cuts from which vegetation was removed.

3. After construction:

a. Replace dying foliage constantly. (Change cut foliage at least every 3 hours when the tactical situation permits.)

b. If the ground under the weapon's muzzle (when aimed within sector of fire from completed position) is dusty, keep it moist but not excessively wet.

c. Upon completion, your position should blend with the surrounding terrain to prevent detection from the front. You or your buddy should check the position from the front to insure sufficient concealment (figure 4).

Figure 4.

REFERENCES:

FM 5-15, Field Fortification, Jun 72 (chap 2, sec II, page 2-2)
FM 5-34, Engineer Field Data, Sep 76 (chap 16, page 361)

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TASK NUMBER: 071-331-0852

CLEAR FIELDS OF FIRE

CONDITIONS:

Given a partially completed fighting position with an assigned sector of fire, containing thick underbrush and small to medium trees, an intrenching tool, an axe, a specified depth or sector of fire to be cleared, and a designated amount of time in which to clear the field of fire.

STANDARDS:

Within designated time, clear your sector of fire out to the specified distance so that:

1. Anyone moving through your sector of fire can be seen from your position.

2. Anyone moving into your sector of fire will not recognize it as a cleared area.

PERFORMANCE MEASURES:

1. **Clearing fields of fire.**

a. In preparing defensive positions for expected contact with the enemy, clear suitable fields of fire within the assigned sectors of fire for each position.

b. Before clearing the fields of fire, you should make a careful estimate as to how much clearing can be done in the time available. This estimate often determines the nature and extent of the clearing to be undertaken, since a field of fire improperly cleared may afford the enemy better concealment and cover than if you left the area in its natural state.

2. **The following principles must be observed:**

a. Do not disclose your position by excessive or careless clearing (figure 1).

b. In areas organized for close defense, start clearing near your position and work forward.

c. In all cases, leave a thin natural screen of vegetation to hide defensive positions.

d. In sparsely wooded areas, remove lower branches of large scattered trees.

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Figure 1.

ORIGINAL TERRAIN

WRONG -- TOO MUCH CLEARING. DEBRIS NOT REMOVED. ENEMY WILL AVOID.

WRONG -- AFTER IMPROPER CLEARING

RIGHT -- ONLY UNDERBRUSH AND TREES DIRECTLY IN LINE OF FIRE REMOVED. ENEMY SURPRISED.

RIGHT -- AFTER PROPER CLEARING

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e. In heavy woods, complete clearing of the field of fire may not be possible or desirable within the time available. Restrict work to thinning undergrowth and removing lower branches of large trees. Clear narrow lanes of fire for automatic weapons, making sure that you clear in an irregular pattern that will not reveal the weapons' positions.

f. Remove or thin dense brush. It is never a suitable obstacle and it obstructs the field of fire.

g. Cut weeds only where they obstruct your view.

h. Drag away cut brush, limbs, and weeds to points where they will not be detected by the enemy or furnish him with concealment.

i. Cover cuts on trees and bushes forward of the position with mud, dirt, or snow.

j. Insure that no trails are made in your sector of fire as lanes are cleared.

REFERENCES:

FM 7-7, The Mechanized Infantry Platoon and Squad, Sep 77 (chap 5, page 5-33)
FM 7-8, The Infantry Platoon and Squad (TBP)

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TASK NUMBER: 071-321-0505

MOVE AS A MEMBER OF A DISMOUNTED MORTAR SQUAD (81-MM MORTAR)

CONDITIONS:

In a designated position (other than squad leader) in a moving wedge formation, in any climatic or terrain condition.

STANDARDS:

Maintain relative position within the wedge with a normal interval of about 10 meters; decrease interval only when necessary to maintain visual contact with the squad leader. React immediately to commands given by the squad leader.

PERFORMANCE MEASURES:

All training in squad movement should be conducted by the squad leader. Squad members and the squad leader must come to know the individual traits and mannerisms of all squad members. More important, the squad members must become familiar with the squad leader's techniques, style, and leadership methods. The following points of correct squad member movement should be stressed.

1. Maintain the same position in the squad wedge regardless of varying interval. (See figure 1.)

2. Maintain visual contact with the squad leader.

3. Perform the same actions as the squad leader while maintaining the same relative position, or react to squad leader's commands. (Examples: "mortar to be mounted here," "direction of fire," "action.")

NOTE: Squad leader places sight box where mortar is to be mounted and points in the direction of fire.

4. Maintain a normal interval of approximately 10 meters between himself and the man next to him, except:

a. Interval should be increased where terrain and vegetation are open.

b. Interval should be decreased when necessary to insure visual contact with the squad leader.

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5. Move into a modified wedge (figure 2) when terrain and/or vegetation makes visual contact with the squad leader impossible, when individual rates of movement vary due to the nature of the terrain, or when directed by the squad leader. (When in a modified wedge, the interval between individuals will vary dependent upon visual contact/lighting conditions. It may be necessary to grasp the web gear of the individual to the front in order to maintain contact during periods of severely limited visibility.)

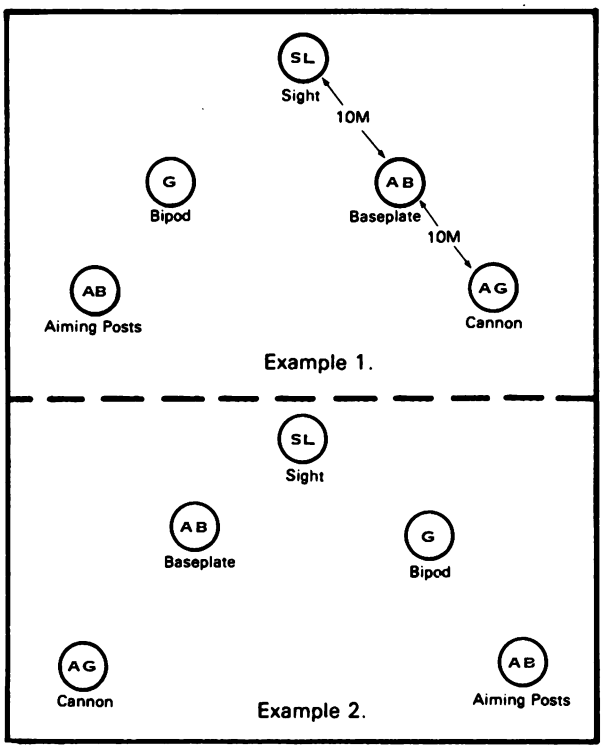

Figure 1.

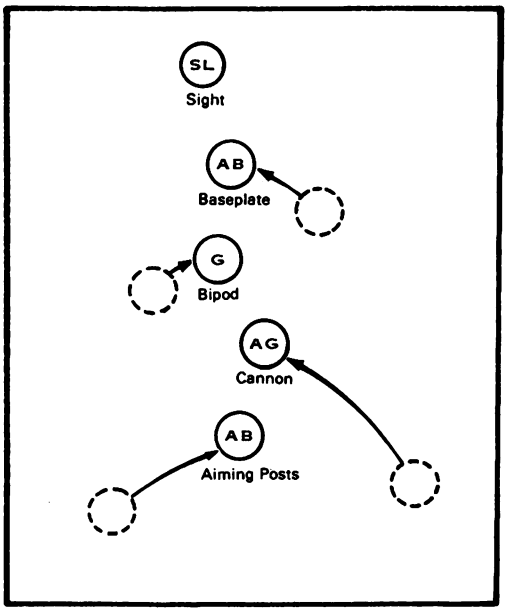

Figure 2.

6. Resume wedge movement formation when conditions necessitating modified wedge have been passed.

REFERENCE:

NONE

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TASK NUMBER: 071-326-0502

MOVE UNDER DIRECT FIRE

CONDITIONS:

During daylight, at a field location containing varied terrain and vegetation, armed with an M16A1 rifle or M203 grenade launcher, wearing web gear, seasonal camouflage uniform (if available), and SCOPES target numbers. You will be opposed by an enemy sniper in a concealed position at least 200 meters away armed with an M16A1 rifle with a 6X rifle telescope (SCOPES equipment) and blank ammunition. You will move as a member of a two-man buddy team over a route which maximizes use of available cover/concealment.

STANDARDS:

Within 15 minutes, move to within 100 meters of the enemy position without being hit (scoped).

PERFORMANCE MEASURES:

1. **How to Select Individual Movement Route (within your team/squad route or axis of advance)** (figure 1).

a. Search the terrain to your front for:

(1) A gully, ravine, ditch, wall, etc., which is at a slight angle to your direction of movement. (These features provide cover and concealment when the low or high crawl is used.)

(2) Hedgerows or a line of thick vegetation. (These provide only concealment when the low or high crawl is used.)

(3) Large trees, rocks, stumps, fallen timber, rubble, vehicle hulks, folds or creases in the ground, etc. (These provide cover and concealment for use as temporary positions. Use the rush if the area between them has no concealment.)

(4) High grass, weeds, etc. (Provides only partial concealment since use of high or low crawl could reveal your location by the movement of vegetation. You might have to use the rush.)

b. Select your next position (and route to it), which:

(1) Exposes you the least to enemy fire.

(2) Does not require you to cross in front of other members of your element and mask their fires.

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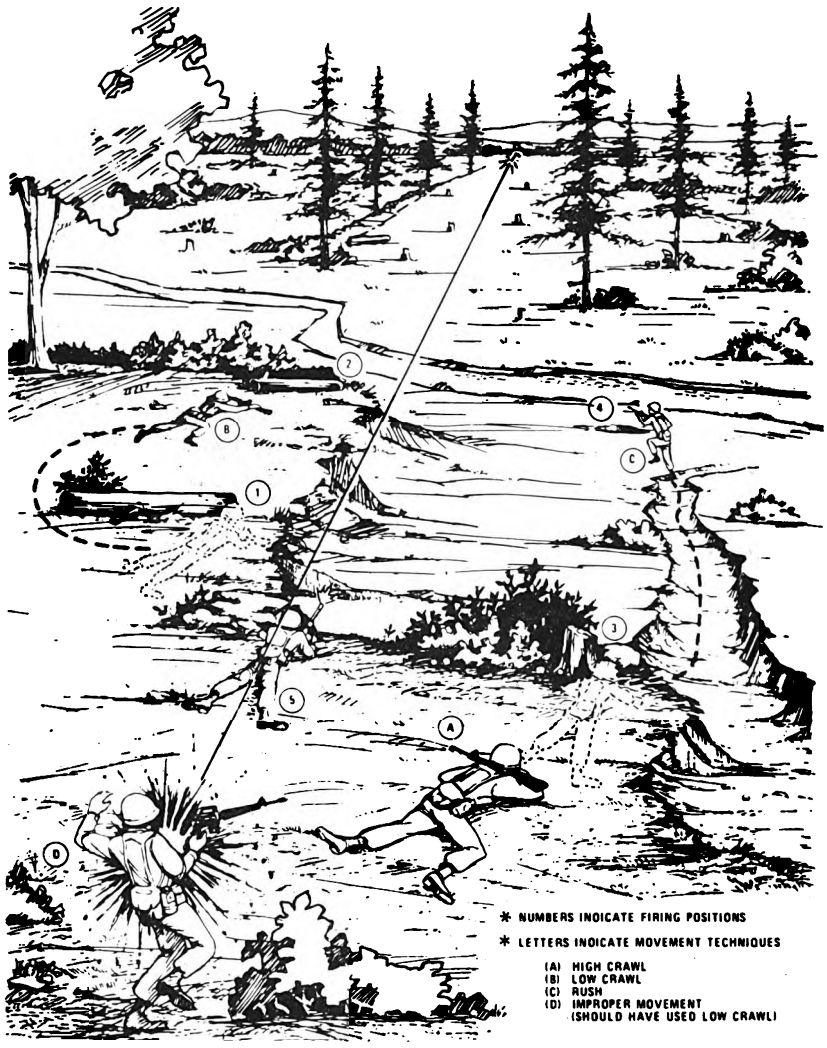

Figure 1.

2. **Determining the Correct Individual Movement Technique:**

a. Use the high crawl when:

(1) The route you have selected provides cover and concealment.

(2) Poor visibility reduces enemy observation.

(3) The terrain/vegetation are suitable only for the low crawl but speed is required.

b. Use the low crawl when:

(1) The route you have selected provides cover or concealment less than 1 foot high.

(2) Visibility provides good enemy observation.

(3) Speed is not required.

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c. Use the rush when:

(1) You must cross open areas.

(2) Time is critical.

3. **To High Crawl** (figure 2).

a. Keep your body free of the ground and rest your weight on your forearms and knees. Cradle the rifle in your arms, keeping its muzzle off the ground.

b. Move forward by alternately advancing your right elbow and left knee; left elbow and right knee, etc.

Figure 2.

4. **To Low Crawl** (figure 3):

a. Keep your body as flat as possible to the ground and grasp the rifle sling at the upper sling swivel, letting the balance of the rifle rest on your forearm and the butt of the rifle drag on the ground.

b. To move forward, pull with your arms and push with your right or left leg, changing legs frequently to avoid fatigue.

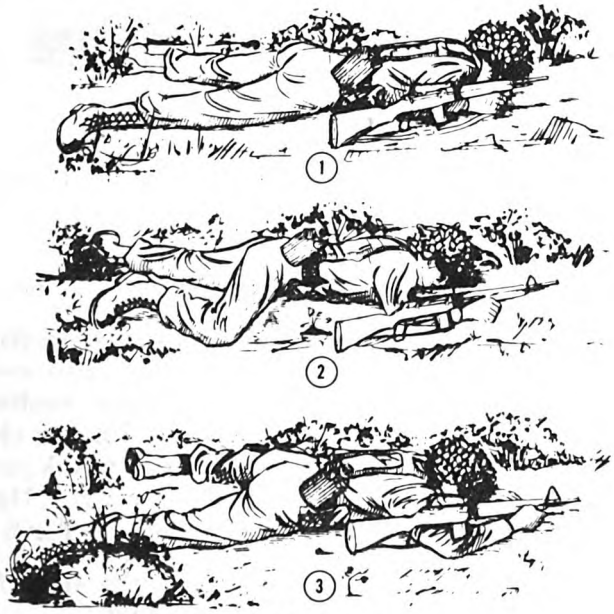

Figure 3.

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5. **To Rush** (figure 4):

a. Start from the prone position by slowly raising your head and selecting your next position.

b. Lower your head, draw your arms in to your body, keep your elbows down, and pull your right (left) leg forward.

c. With one movement, raise your body by straightening your arms, spring to your feet, and step off with either foot.

d. Run to the next position and, just before hitting the ground, plant both feet.

e. Fall forward, breaking your fall with the butt of the rifle.

f. Shift the weight of your body to your left (right) side, place the butt of the rifle in the hollow of your shoulder, and then roll into a firing position.

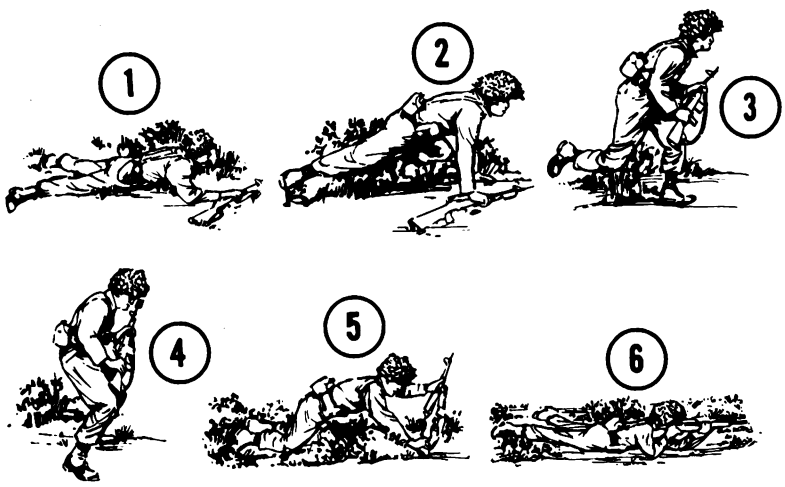

Figure 4.

TRAINING NOTES

1. Short rushes from covered position to covered position may be used when enemy fire allows brief exposure. Maneuver teams, buddy teams, or individuals may advance by short rushes to avoid accurate enemy fire. Try not to stay up any longer than 3 to 5 seconds so that you don't give the enemy time to track you with his automatic fire. The rule is to rush from cover to cover. Don't hit the ground in the open just because you have been up for 5 seconds.

2. Don't rush from a position from which you've been firing; roll right/left or crawl before springing to your feet.

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3. When you complete a rush to a position providing concealment but no cover (weeds, bushes, etc.), roll or crawl to a new position before firing.

4. When you move as a member of a buddy team, you must communicate (talk to, watch and signal, etc.) with each other. Insure that one man covers by fire any movement by the other man. When moving as a member of a fire team, watch and listen to your team leader; he will lead you along the best route (covered and concealed) available and insure that covering fire is provided when you move. STAY WITH HIM AND FOLLOW HIS EXAMPLE.

REFERENCES:

FM 7-7, The Mechanized Infantry Platoon and Squad, 30 Sep 77 (chap 3, page 3-24)
FM 7-8, The Infantry Platoon and Squad (TBP)
FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)
TEC Lesson 020-071-1042-F, React to Indirect Fire

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TASK NUMBER: 071-326-0510

REACT TO INDIRECT FIRE

CONDITIONS:

You are a member of a squad/section other than team leader or squad leader.

Situation 1: You are not moving (i.e., in day or night defensive position or during a break in a tactical movement). You hear either the sound of incoming rounds or someone shouting "Incoming!"

Situation 2: Your squad/section is making a foot movement. You hear either the sound of incoming rounds or someone shouting "Incoming!"

STANDARDS:

React to each situation IAW performance measures below.

PERFORMANCE MEASURES:

1. **If you are subjected to an indirect fire attack,** there is a good chance you will have some warning before the first shell explodes in your area. This warning may be either of the following:

a. The sound of incoming shells.

b. A shouted warning of "Incoming" from someone who hears the shells coming before you do.

c. The sound of shells passing overhead or exploding nearby, but not yet zeroed in on your location.

2. **The first thing you should do is shout or repeat "Incoming,"** when you hear any of the above warnings. This is standard procedure for incoming indirect fire and will alert others who might not have heard the warning. Indirect fire will normally be from artillery, mortars, rockets, or similar weapons.

3. **Look to your fire team/squad leader before taking any other actions.**

4. **Actions to take if not moving:**

a. When you hear any of the warnings in paragraph 1a, b, or c, shout "Incoming!"

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b. Remain in your defensive position, taking advantage of any available cover. If your defensive position has not been dug yet, then look for some type of cover that will protect you from indirect fire.

c. Any movement away from your position could let the enemy know exactly where you are.

d. Incoming indirect fire (zeroed in on your position) may be an indicator of a coming attack by ground forces.

5. **Actions to take if moving:**

a. When you hear any of the warnings in paragraph 1a, b, or c, shout "Incoming!"

b. Follow your team leader's actions.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition - TBP)
TEC Lesson 010-071-1042-F, Reacting to Indirect Fire

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TASK NUMBER: 071-326-0511

REACT TO FLARES

CONDITIONS:

At night, upon hearing a flare rising or when suddenly illuminated by a ground or overhead flare.

STANDARDS:

React as specified for each situation listed in the performance measures.

PERFORMANCE MEASURES:

React as follows for each situation:

1. **Ground flares:** move out of the illuminated area, and:

   a. When alone, reorient yourself and continue mission.

   b. As a member of a combat element, regroup (by SOP or as instructed) and continue mission.

2. **Overhead flare with warning** (sound of rising flare): assume a prone position (behind concealment when available) before the flare bursts.

3. **Overhead flare without warning:**

   a. Get into the prone position, making maximum use of nearby cover, concealment, and shadows until the flare burns out. Close one eye to protect your night vision; observe with the other. (See figure 1.)

   b. When crossing wire obstacles where the prone position is not possible, crouch low until flare burns out.

4. **Ground or overhead flare while under direct enemy fire or followed by direct enemy fire:** use fire and maneuver (select temporary position, rush, low crawl, etc., as specified in applicable tasks) as you would during daylight.

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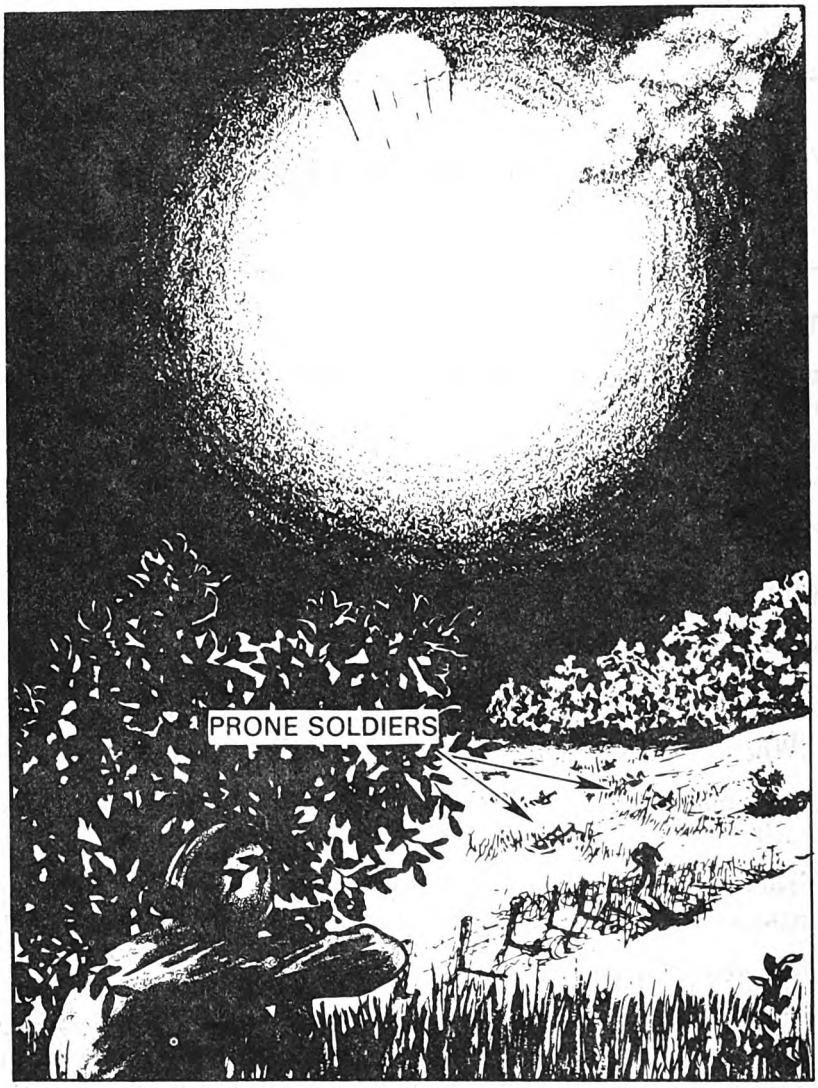

Figure 1.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)
TEC Lesson 020-071-1049-F, Reacting to Flares

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TASK NUMBER: 071-326-0503

MOVE OVER, THROUGH, OR AROUND OBSTACLES

CONDITIONS:

During daylight, at a field location moving over a route with manmade obstacles (two walls and two barbed-wire entanglements), given one smoke grenade, wood or grass mat, or chicken wire, and a grappling hook. You will be opposed by an OPFOR in a concealed position armed with an M16A1 rifle with 6X telescope (SCOPES equipment), located at least 200 meters away.

STANDARDS:

Within 20 minutes, move along the predesignated route to within 100 meters of the OPFOR without being hit (scoped).

PERFORMANCE MEASURES:

1. Use smoke as an effective method of concealment to cover your advance while crossing the obstacle.

2. Barbed wire obstacles:

WARNING:

1. First, check it for boobytraps or early warning devices. It is threat doctrine to attach trip wire-activated mines to barbed wire. A grappling hook with a length of rope attached should be used first to pull the wire. Before pulling wire, check for early warning devices attached to the wire.

2. If no such devices are found, then cross the barbed wire, using one of the methods listed in paragraph 2.

a. To cross over the barbed wire, you may put a wood or grass mat, or chicken wire netting, over it. Cross carefully because such a mat or net forms an unstable path (figure 1).

b. To cross under the wire, slide headfirst under the bottom strands on your back. Push yourself forward with your shoulders and heels. Carry your weapon lengthwise on your body. Let the wire slide on the weapon to keep the wire from catching on clothing and equipment. Inch your way along, holding the wires with one hand (figure 1).

c. If it is necessary to cut your way through wire, cut only the lower strands. Leave the top wire in place to make it less likely that the enemy will discover the gap. Wrap cloth, such as rifle patches, around the wire between

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your hands and cut partly through the wire. Quietly bend the wire back and forth until it separates.

Figure 1a.

Figure 1b.

REMEMBER

Obstacles are always covered by either fire or observation.

Figure 2.

3. To negotiate minefields or boobytraps, see TASKS: **Locate mines by visual means,** and **Neutralize enemy mines.**

4. To cross roads, trails, or small streams, select a point at or near a bend in the road or stream—if possible, a bend that has concealment and cover on both sides. This will offer less chance of being seen by the enemy when crossing. Crawl up to the edge of the open area and observe the other side carefully before crossing. Cross rapidly but quietly. Get down on the other side; check the area around you (figure 3).

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TASK NUMBER: 071-326-0512

ESTIMATE RANGE

CONDITIONS:

Given personnel, equipment, silhouettes, and/or vehicles, all stationary and either partially or fully exposed, at ranges from 50 meters to 3,000 meters, during daylight in weather conditions where all objects are visible.

STANDARDS:

State the distance to each object with no more than a 20% error in the actual distance.

PERFORMANCE MEASURES:

1. **Appearance-of-Objects Method.** You must learn the appearance of various objects (personnel, vehicles, equipment, silhouettes) at known ranges in various light and weather conditions, noting in particular which details become unrecognizable as the range increases, and the apparent size of the objects at various ranges.

2. **Unit-of-Measure Method.** Become familiar with the appearance of 100-meter intervals on the ground.

a. For ranges up to 500 meters - estimate the number of 100-meter intervals between you and the target (NOTE: During training, pace off the actual distance in order to confirm range sensing).

b. For ranges between 500 and 1,000 meters - pick a point halfway between you and the target and determine the distance to the halfway point as described above. Double the estimate to find range to target.

c. Learn the effect of terrain (slopes and dead space) on the appearance of objects at 100-meter intervals.

3. **Flash-and-Sound Method** (figures 1 and 2). When you see the flash or smoke of a weapon or the dust it raises, immediately start counting at a rate of three counts per second. Stop when you hear the report of the weapon. The number you are counting when you stop is the approximate distance to the weapon in hundreds of meters. For example, if you stop on the number three, the distance is about 300 meters. Practice counting at three counts per second. This can be done with blank ammunition fired at known distances, or by having someone time you while you count. When counting at the correct rate, you should count to 30 in 10 seconds. Practice until your timing is correct.

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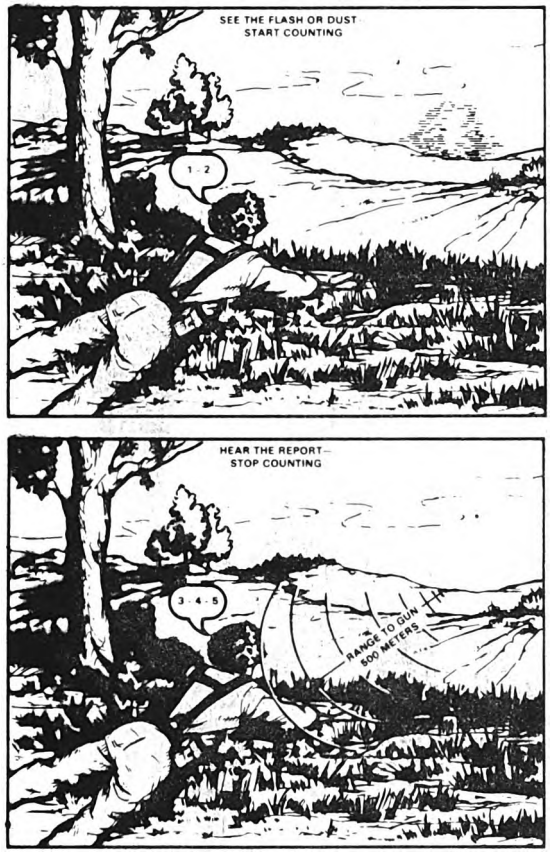

Figure 1.

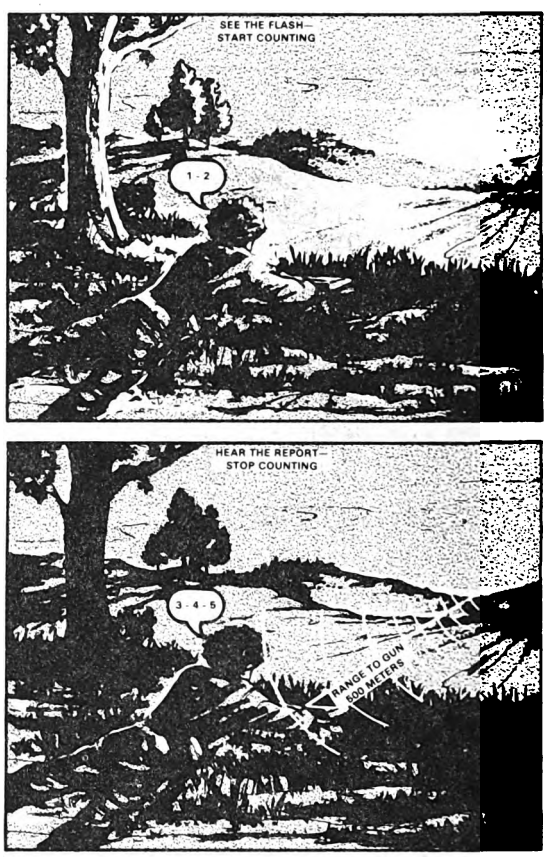

Figure 2.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)
TEC Lesson 020-171-1611-F, Target Range Determination

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TASK NUMBER: 071-326-0513

SELECT TEMPORARY BATTLEFIELD POSITIONS

CONDITIONS:

During daylight or darkness; at an overwatch position; after initial movement into tentative defensive positions; at a halt during movement; or upon receiving direct fire.

STANDARDS:

1. Select and occupy a firing position which allows good observation, fields of fire, and provides (in order of priority):

   a. Cover and concealment, or

   b. cover only, or

   c. Concealment only.

2. Remain as low as possible (prone where possible) and look (aim) around rather then over objects.

PERFORMANCE MEASURES:

Select temporary firing or observation positions which take advantage of available cover and concealment (figure 1).

1. Observe and fire around the side of an object. This conceals most of your head and body.

2. Stay low to observe and fire whenever possible. You can aim better and take advantage of concealing vegetation to present the smallest possible target to enemy observation and fires.

3. Select a good background before observing. A good background does not silhouette the individual.

4. Follow team leader's directions after your initial selection of temporary battlefield position; he might reposition you to gain better team coverage of the area.

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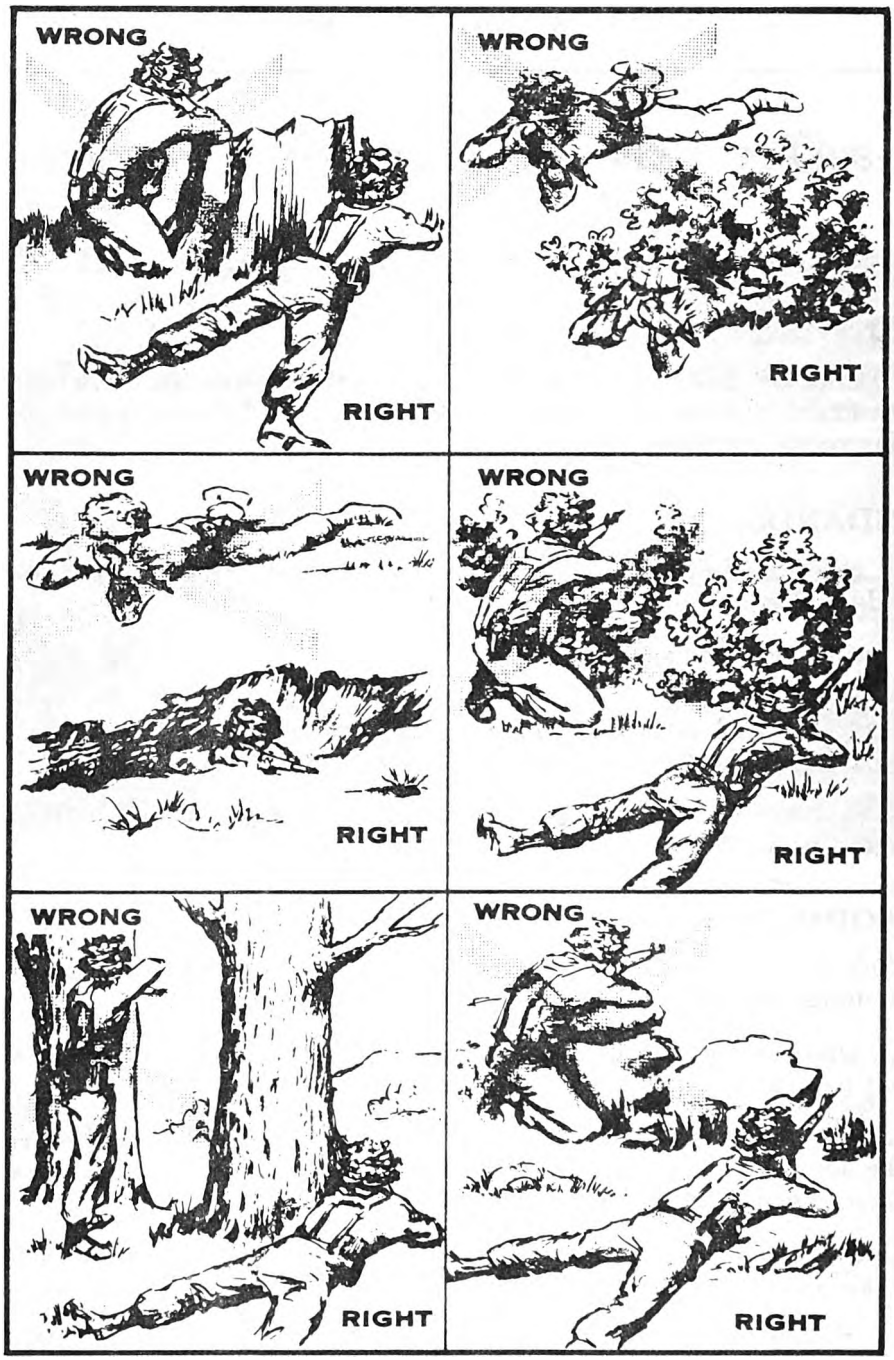

Figure 1.

REFERENCE:

FM 21-75, Combat Skills of the Soldier, (TBP)

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TASK NUMBER: 071-326-5703

CONSTRUCT INDIVIDUAL FIGHTING POSITION

CONDITIONS:

As a member of a two-man team, in daylight, given load-bearing equipment with bayonet, scabbard, entrenching tool, poncho, and M16A1 rifle; the specific location and sector of fire of the position to be constructed (NOTE: Position should afford natural cover such as mounds or earth, stumps, trees, rocks, etc., and observation and fields of fire); logs to construct overhead cover; and 4 hours to complete construction.

STANDARDS:

Within time specified, completed position must meet the following specifications:

NOTE: Time may be adjusted when soil and weather conditions make construction of positions particularly difficult.

1. **Cover** - Affords protection from direct frontal small-arms fire (by means of a natural or manmade frontal parapet high and thick enough to protect your head completely while manning your weapon) and from effects of indirect fire (shrapnel) (normally requires at least 18 inches of dirt/log overhead protection).

2. **Concealment** - Position cannot be easily detected from front (e.g., blends with surroundings well enough that an approaching soldier approximately 35 meters to front (hand-grenade range) cannot detect it).

3. **Fields of Fire** - Limiting stakes are emplaced and correctly define sector of fire. Soldier can observe anyone moving through his sector. Fields of fire have been selectively cleared so that anyone moving into the sector will not recognize it as being a cleared area.

4. **Size and Shape** - As a minimum, position should be shoulder wide, armpit deep, and provide enough room for the soldier to engage targets in his sector using the normal foxhole firing position.

5. **Optional** (dependent on available time) - Position includes grenade sump, sloping floor with shallow trench to facilitate drainage, elbow holes to stabilize firing position and to lower silhouette when firing, range card, and night firing stakes.

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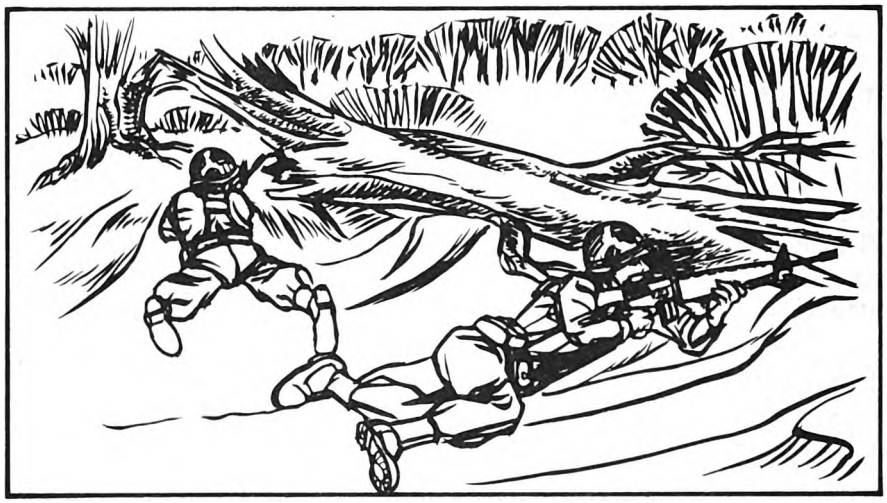
PERFORMANCE MEASURES:

1. **Hasty Fighting Positions.** When you first move into a battle position, you may have very little or no time to prepare the position from which you must fight. If that is the situation, then occupy a hasty fighting position. A hasty fighting position is behind some natural object on the terrain that affords you frontal protection from direct fire but also allows you to fire forward.



Note that the term hasty position does not mean that you can't dig. Even if you only have a few minutes, you can dig or scrape out a prone shelter that will give you increased protection.

2. **Improved Fighting Positions.** As time and conditions permit, the position can be improved, but the natural cover that was initially used in the hasty position will still be the basis for constructing your fighting position.

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(3) Frontal cover. Ideally, a natural parapet such as a tree, mound, rock, or stump that will blend with the surrounding terrain will be available. Otherwise, you must build your own parapet using dirt from the hole. At least the equivalent of 18 inches of earth should be between you and the enemy. Frontal cover is important so you can shoot without exposing your head to enemy fire.

PROVIDE SUPPORT FOR THE FIRER

The space between the hole and the frontal protection should be wide enough to allow the soldier to fire from a supported position (one with elbows on the ground).

Supported fire to the front.

Unsupported fire to the front.

Figure 1b.

ROCKS ARE OK FOR LIMITING STAKES

Place AIMING STAKES toward especially dangerous approaches so you can lay your weapon on these approaches even at night.

Place LIMITING STAKES right and left, to define your sector of fire; they will also prevent accidental firing into adjacent positions.

NOTE:

Care must be taken not to destroy the concealment of the position with limiting stakes.

d. Complete clearing fields of fire. Clear only what is absolutely necessary. Get in firing position and check observation and fields of fire. Save any cut foliage, dirt, grass clumps, etc., for camouflage of position.

NOTE: Task Number 071-331-0852, Clear fields of fire, will give you more detailed information on this performance measure.

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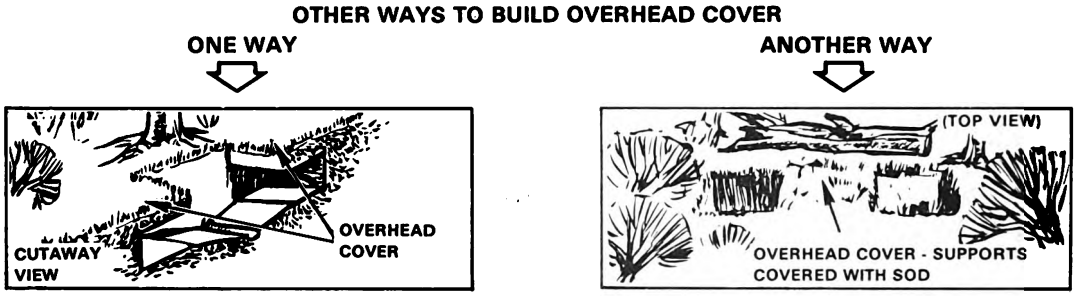
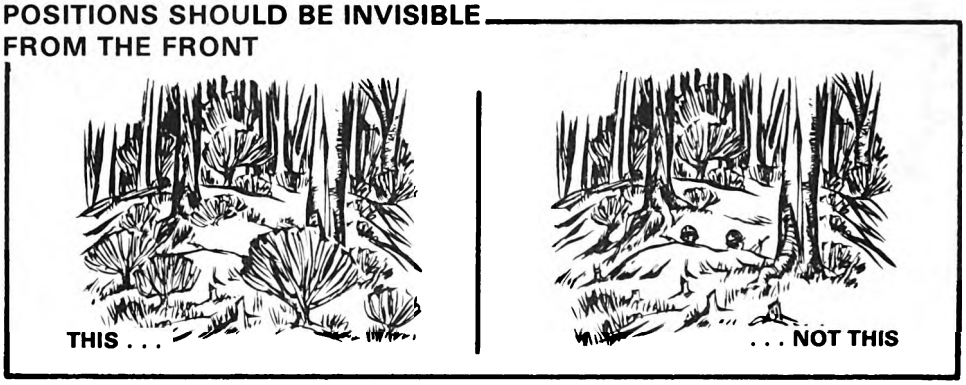


g. Camouflage position using available materials (grass clumps, foliage, etc.). Make your position blend into surroundings. Check camouflage by moving 35 meters to the front; if you can spot it easily, you need more work on camouflage.



NOTE: Task Number 051-202-1003, Camouflage/conceal defensive positions, will give you more detailed information on this performance measure.

h. Improve your position as time permits:

(1) To insure complete protection for fighting positions, flank and rear cover is necessary. It protects against the effects of indirect fire that bursts to the flanks/rear of the positions and against the effects of friendly supporting weapons located in the rear.

(2) Dig grenade sump at 45-degree angle and at least 2 feet deep. Slope floor of foxhole and dig shallow trench to allow for drainage. Put in night firing stakes and make a range card. Improve camouflage. Construct alternate and secondary positions as directed by your squad leader. Replace dead foliage as needed to maintain camouflage.

REMEMBER,

you can always improve your position.

4. **Variations of the Basic Fighting Position.** The terrain will sometimes force you to modify the basic construction of your position in order to fight effectively. Some variations are:

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a. One-man fighting position.

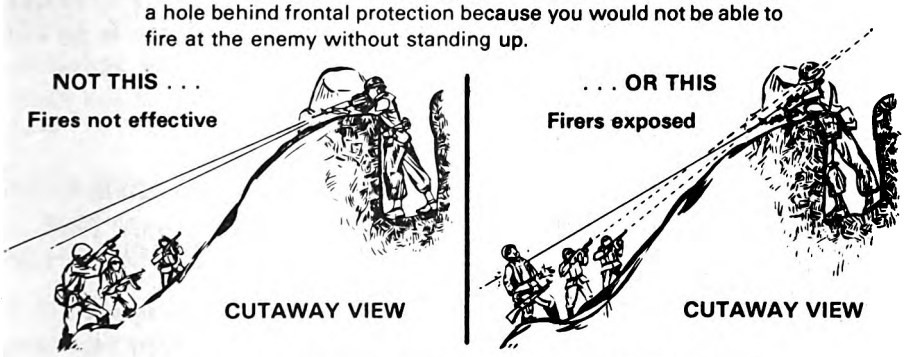
b. Modified two-man position.

c. Positions on steep terrain.

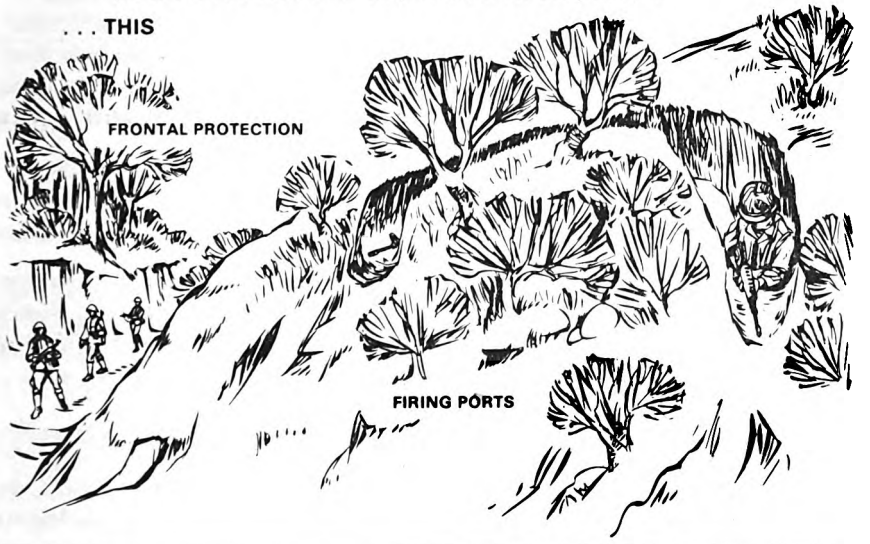
NOTE: Appendix C, FM 7-7, The Mechanized Infantry Platoon and Squad, provides specific information on construction techniques for these types of fighting positions.

POSITIONS ON STEEP TERRAIN

When building positions on steep terrain, you cannot simply dig a hole behind frontal protection because you would not be able to fire at the enemy without standing up.



To overcome this problem, dig your hole and then cut firing ports forward from each end of the hole. The ground between the firing ports then serves as frontal protection for the position.



REFERENCES:

FM 7-7, The Mechanized Infantry Platoon and Squad, Sep 77 (app C, pages C-1 thru C-18)
FM 7-8, The Infantry Platoon and Squad (TBP)

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TASK NUMBER: 071-326-0600

USE VISUAL SIGNALS TO CONTROL MOVEMENT (DISMOUNTED)

CONDITIONS:

Given a combat or field training situation with necessary flags or flashlights, and you are moving dismounted. Radio communications may or may not be available, and radio silence may or may not be imposed.

STANDARDS:

1. Skill Level 1: Demonstrate the correct procedure for each signal in the performance measures below.

2. Skill Level 2: Train each member of your squad to recognize each signal and require them to take appropriate actions.

PERFORMANCE MEASURES:

1. Visual communication is a means available to all units. Visual signals are transmitted by flags, lights, pyrotechnics, panels, arm-and-hand signals, and other prearranged methods. They are suitable for transmitting prearranged messages rapidly over short distances as well as for recognition and identification of friendly forces.

2. Visual signals also facilitate ease in controlling the action(s) or movement(s) of the follower and conversely visual signals can influence the action(s) or movement(s) of the leader.

3. It is important that you familiarize yourself with all the visual signals used on the battlefield. However, it is more important that you know those signals which can assist you in performing your specific job effectively in the event alternate means of communication are not available.

4. Signals for combat formations and battle drill.

a. These signals may be used, as appropriate, by either mounted or dismounted troops. They give the soldier a means of communication between himself and other persons or units. They must be practiced until their use becomes second nature. Signals must be given correctly and distinctly.

b. When a movement or action is to be executed by less than the total unit, the signaler will point, if necessary, toward the person(s) or element(s) of a unit as a warning that a signal will follow. However, when a movement or action is to be executed by the entire unit, the proper signal should be preceded by the signal ATTENTION. Most signals may be given from the ground or from a vehicle. Unless otherwise indicated in the illustrations, the

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signaler will face the person(s) or element(s) for which the signal is intended.

5. Listed below are selected visual signals. You should know these standard arm-and-hand signals.

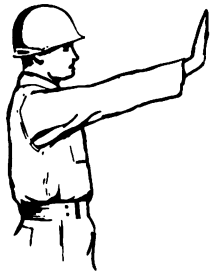
SPECIAL EMERGENCY AND WARNING SIGNALS

AIR ATTACK. Rapidly cross and uncross arms fully extended above the head.

NUCLEAR WARNING. Cover both eyes with the right hand to warn exposed troops to take cover before the detonation of nuclear weapon.

NUCLEAR, BIOLOGICAL, CHEMICAL (NBC) HAZARD. After donning the field protective mask, extend both arms horizontally sideways with fists doubled facing up; rapidly move fists to the head and back to the horizontal; repeat.

SIGNALS FOR COMBAT FORMATIONS AND BATTLE DRILL

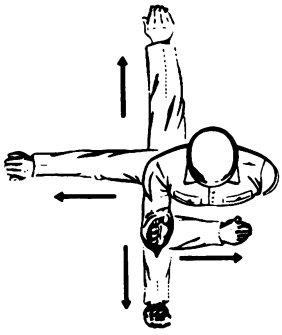


I AM READY or ARE YOU READY? Extend the arm toward the person being signaled; then raise arm slightly above horizontal, palm facing outward.

ATTENTION. Extend the arm sideways, slightly above horizontal, palm to the front; wave arm to and away from the head several times.

I DO NOT UNDERSTAND. Raise both arms sideward to the horizontal; bend both arms at elbows and place both hands across the face, palms to front.

DISREGARD PREVIOUS COMMAND or AS YOU WERE. Raise both arms and cross them over the head, palms to the front.



DISPERSE. Extend either arm vertically overhead; wave the hand and arm to the front, left, right, and rear, with the palm toward the direction of each movement.

ASSEMBLE or RALLY. Raise the arm vertically overhead, palm to the front, and wave in large horizontal circles.

NOTE: Signal is normally followed by the signaler pointing to the assembly or rally site.

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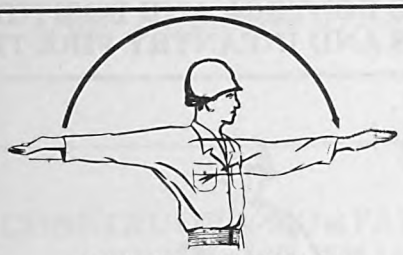
JOIN ME, FOLLOW ME, COME FORWARD, or MOVE VEHICLE FORWARD. Point toward person(s), vehicle(s), or unit(s); beckon by holding the arm horizontally to the front, palm up, and motioning toward the body.



ADVANCE or MOVE OUT. Face the desired direction of movement; hold the arm extended to the rear; then swing it overhead and forward in the direction of desired movement until it is horizontal, palm down.

FIX BAYONETS. Simulate the movement of the right hand in removing the bayonet from the scabbard and fixing it on the rifle.

HALT or STOP. Raise the hand upward to the full extent of the arm, palm to the front. Hold that position until the signal is understood.

INCREASE SPEED, DOUBLE TIME, or RUSH. Raise the hand to the shoulder, fist closed; thrust the fist upward to the full extent of the arm and back to the shoulder rapidly several times.

DECREASE SPEED (vehicle), QUICK TIME (dismounted troops). Extend the arm horizontally sideward, palm to the front, and wave arm slightly downward several times, keeping the arm straight. Do not move arm above horizontal.

ECHELON RIGHT (LEFT). Extend one arm 45° above and the other 45° below the horizontal, palms to the front. The lower arm indicates the direction of echelon.

WEDGE FORMATION. Extend both arms downward and to the sides at an angle of 45° below the horizontal, palms to the front.

COLUMN FORMATION (or FILE). Raise either arm to the vertical position. Drop the arm to the rear, describing complete circles in a vertical plane parallel to the body. The signal may be used for a column of dismounted troops or a vehicular column.

ENEMY IN SIGHT. Hold rifle above the head with one arm, fully extended, with the rifle parallel to the ground and pointing in the direction of the enemy.

LINE FORMATION. Raise both arms to the side until horizontal, arms and hands extended, palms down.

ACTION FRONT (RIGHT, LEFT, or REAR), FIGHT ON FOOT, or ASSAULT FIRE. Raise fist to shoulder level and thrust it several times in the desired direction of action.

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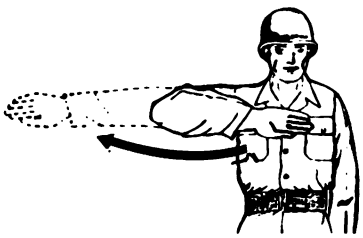
SIGNALS FOR FIRE CONTROL AND POSITIONING OF CREW-SERVED WEAPONS AND INFANTRY FIRE TEAMS

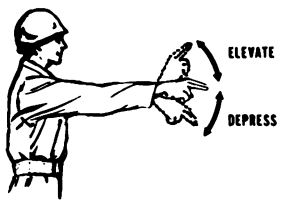
PREPARE FOR ACTION. Raise the fist to the waist and rotate forearm several times in horizontal, clockwise circles.

OUT OF ACTION. Strike the closed fist of one hand several times in rapid succession against the open palm of the other hand.

CEASE FIRING. Raise the hand in front of the forehead, palm to the front, and swing the hand and forearm up and down several times in front of the face.



MOVE OVER or SHIFT FIRE. Raise the hand that is on the side toward the new direction across the body to the opposite shoulder, palm to the front; then swing the arm in a horizontal arc, extending arm and hand to point to the new direction. For slight changes in direction, wave hand from final position (described above) to the desired direction of movement.



TRAVERSE RIGHT (LEFT) or ELEVATE (DEPRESS). Extend one arm in direction of gunner concerned. Move the hand in a vigorous movement in the direction of desired correction (elevate, depress, right, or left). Flex arm at wrist and expose one finger for each mil (or for each 100 meters of range) of desired correction. For machineguns, the extended fingers indicate 1 mil for tripod guns and 1 meter for bipod guns.

COMMENCE FIRING. Extend arm in front of the body, palm down, and move it through a wide horizontal arc several times. For machineguns: giving the signal again, moving the arm faster means "change to the next higher rate of fire." To slow the rate of fire, move the arm slower. (Used primarily for direct fire weapons.)

REFERENCES:

FM 21-60, Visual Signals, Dec 74 (chap 2, page 2-1 thru 2-10)

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TASK NUMBER: 071-326-0514

CONSTRUCT A MORTAR POSITION (81-MM, 107-MM [4.2-IN])

CONDITIONS:

In daylight, in a field environment, given load-bearing equipment, with bayonet, scabbard, intrenching tool, and mortar; the appropriate location and general direction of fire and amount of front to be covered.

STANDARDS:

Within time specified by supervisor, completed position must meet the following specifications:

1. Cover and Concealment: Affords protection from effects of indirect fire (fragmentation) and should be camouflaged from aerial and ground observation.

2. Size and Shape: Conforms to the following specifications, shown in figure 1 (measurements given are in M16 rifle lengths).

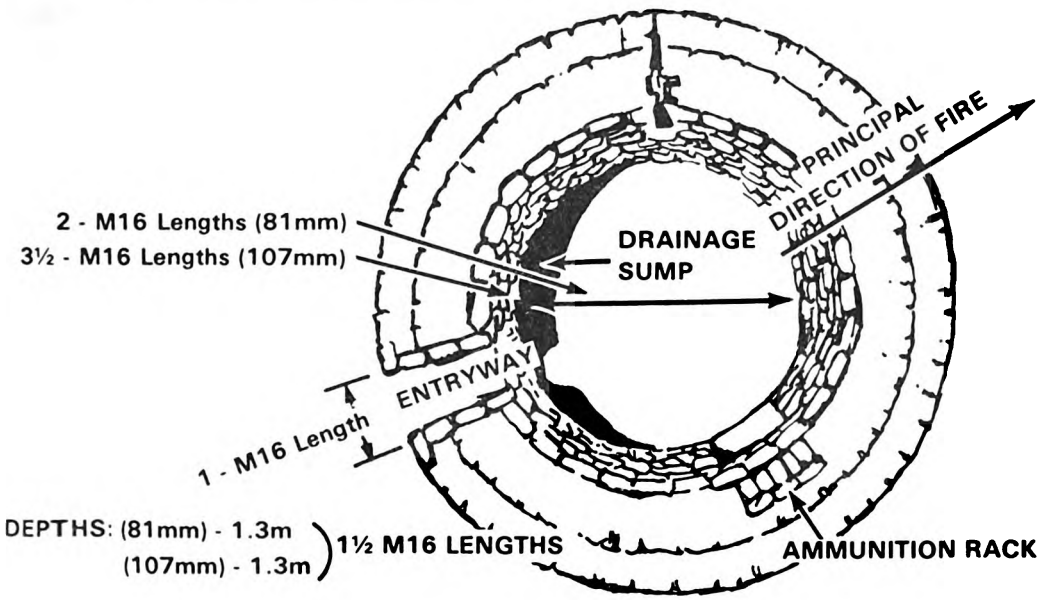

Figure 1.

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PERFORMANCE MEASURES:

Construction of a mortar position should generally follow this sequence:

1. You (the mortar squad leader) select the exact location for the tube. During your selection, keep in mind the use of natural camouflage. While camouflage is desirable, overhead clearance is necessary due to the high angle of fire, and this may require the trimming of tree limbs.

2. Next, dig in. The emplacement illustrated in figure 1 is circular. It is prepared to the dimensions shown with the sides of the emplacement sloping inward toward the bottom. The floor slopes to the drainage sump under the gap in the parapet. An ammunition ready rack, or niche, is built into the side of the emplacement so that it is convenient for the assistant gunner. The bottom of the ammunition rack is elevated from the floor of the emplacement. Another ready rack may be constructed in one side of the trench leading to the position. The initial emplacement is revetted using sandbags, and the improved emplacement is revetted using corrugated metal. Before constructing the parapet, the mortar is laid for direction of fire by the use of an aiming circle or alternate means. The parapet should be not more than ½ M16 length high and a minimum of 1 M16 length wide. An exit trench may be constructed leading to personnel shelters and to other mortar positions.

a. The 81-mm Mortar. A pit type emplacement for the 81-mm mortar is shown in figure 1.

b. The 107-mm (4.2-in) Mortar. The 107-mm mortar emplacement is identical to the one described above for the 81-mm mortar except for dimension changes shown in figure 1. While digging the position and making the parapet, keep in mind your aiming stakes. Since they will be outside of the hole, a portion of the parapet will have to have a notch built so that you can see the aiming posts. The amount of the parapet that has to be notched will depend on the area coverage you are responsible for.

NOTE: While the mortar position is being dug, it is important to insure that the mortar is properly laid and ready to fire. If the temporary mortar position is directly in front of or behind the emplacement under construction, then it will be easier to properly lay the tube after it is placed in the position.

REFERENCES:

FM 5-15, Field Fortifications, Jun 72 (chap 2, page 2-13, para 2-9)

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TASK NUMBER: 071-326-5704

SUPERVISE/EVALUATE CONSTRUCTION OF A FIGHTING POSITION

CONDITIONS:

During daylight in a field or combat situation, given personnel, equipment, and a sector of responsibility.

STANDARDS:

Within specified time limits, the position is completed and meets the following minimum requirements.

1. **Cover** - Affords protection from direct frontal small arms fire (e.g., a natural or manmade frontal parapet high enough to protect head completely while manning weapon and from indirect fire (shrapnel) (normally requires at least 12 inches of dirt/log overhead protection).

2. **Concealment** - Position cannot be easily detected from the air or from 35 meters to the front (e.g., blends with surroundings well).

3. **Fields of Fire** - Limiting stakes correctly define sector of fire. Occupant in firing position has observation in sector and fields of fire which have been selectively cleared, but which have not destroyed natural camouflage.

4. **Size/Shape** - Position is armpit deep and at least shoulder wide (of occupant), provides a cave-like compartment with overhead cover big enough for occupant to get under.

5. **Optional** - If time permits, position includes grenade sump, sloping floor with shallow trench to facilitate drainage, elbow holes to stabilize firing position and to lower silhouette when firing, range card, and night firing stakes.

PERFORMANCE MEASURES:

Through supervision, evaluation, and on-the-spot corrections, insure that the construction of the individual fighting position generally follows the sequence below:

1. Assign position location and sector of fire. Individual should emplace sector-of-fire stakes.

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2. Individual should partially clear fields of fire within his sector and dig a hasty hole for minimum protection, being careful not to destroy natural camouflage around his position; he should save grass clumps, etc., for camouflage later on.

3. Individual should next dig in, making hole armpit deep. If he has a natural frontal parapet, the dirt from hole should be carried away and camouflaged; if not, the dirt should be used to make a frontal parapet.

4. Individual can now complete clearing fields of fire; he should clear only what is absolutely necessary. Insure that individual gets in firing position and checks observation in fields of fire.

5. Individual should next camouflage his position using available materials (e.g., grass clumps, foliage, etc.), blending the position with the surroundings. The camouflage should be checked by moving approximately 35 meters to front and observing the position; if the position can be spotted easily, more work on camouflage is needed.

6. After all of the above have been accomplished satisfactorily, the individual should cosntruct overhead cover. He should use logs, planks, etc., which will support at least 12 inches of dirt, and dig a cave-like area big enough to get under.

7. Upon completion of the overhead cover, the individual should begin to improve his position. Items to check for include grenade sump, drainage trench, elbow holes, night firing stakes, range card, and improvement of camouflage.

REFERENCE:

None

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TASK NUMBER: 071-331-0801

USE CHALLENGE AND PASSWORD

CONDITIONS:

Given current challenge and password and a defensive position with designated sector of fire. Soldier will be told that enemy and friendly personnel may enter his sector and that he is to allow friendly personnel to pass only if they respond with correct password and to detain (capture) other personnel as he is able.

STANDARDS:

Soldier will:

1. Detect and halt personnel in his sector.

2. Challenge them using correct challenge.

   a. If given correct password, allow personnel to pass.

   b. If not given correct password, attempt to detain (capture) personnel as he is able.

PERFORMANCE MEASURES:

IF ONE MAN DESIRES TO PASS:

1. Seeing or hearing someone approach your position, before that person gets close enough to pose a threat, command the person to "Halt!" Use a clear voice, just loud enough to be heard.

2. Seeing the stranger halt, keep the stranger covered and without exposing your position, ask "Who is there?" Again, use a clear voice but just loud enough to be heard so the enemy won't overhear if he's nearby.

3. When the stranger identifies himself, such as "Private Willard, Messenger," you order him to "Advance to be recognized."

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4. Maintain your concealed position and keep the stranger covered with your weapon. When the stranger gets within two or three meters of you, again order him to "Halt!"

5. Issue the challenge in a soft voice and wait for the stranger to reply with the correct password. Hearing the correct password, give permission to pass if you have no other reason for doubt. If doubt still exists, demand further identification or ask a question only a friendly person would be able to answer.

IF A GROUP DESIRES TO PASS:

6. The procedure and precautions for a group are almost the same as for one man. Seeing or hearing a group approach, before they are close enough to pose a threat, order them to "Halt!"

7. The leader of the group should identify the group, such as "Friendly Patrol." Since you don't want the whole group to advance on you at once, order "Advance **one man** to be recognized."

8. When the leader has come forward to be recognized give him the challenge and get the password in reply.

9. Once you're satisfied that the leader is friendly, have the rest of the patrol advance one by one and let the leader identify each man.

10. Person(s) not able to give the proper password or identify himself to your satisfaction is disarmed and detained. Then notify your immediate superior.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)
FM 22-6, Guard Duty, C1, Sep 71 (chap 9, pages 9-1 and 9-2; app F, pages F-1 to F-4)
TEC Lesson 935-071-1029-F, Counterintelligence

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TASK NUMBER: 071-331-0802

PROCESS KNOWN OR SUSPECTED ENEMY PERSONNEL

CONDITIONS:

Given an area with friendly civilians and other friendly elements, two surrendering enemy personnel with weapons (rifles, bayonets, pistols, etc.) and military documents, a designated prisoner of war (PW) collection point 200 meters to the rear, and PW tags.

STANDARDS:

Within 15 minutes, without letting the prisoners talk to each other, and without letting anyone harm them, remove all weapons and documents except individual ID papers; tag prisoners and their equipment with your complete unit ID, date, time, and circumstances of capture; and turn the prisoners' weapons and documents over to the collection point.

PERFORMANCE MEASURES:

Suspected or known enemy personnel must be handled under the following rules:

1. **SEARCH prisoners** (figure 1) for weapons and documents as soon as you capture them. Take weapons to prevent resistance and take documents, except individual identification papers, to prevent the prisoners from destroying them. Prisoners from whom personal property is taken, including personal documents, should be given a written receipt for the property. Tag documents and personal property taken so you know which prisoner had them. Allow prisoners to keep items needed for their general welfare or safety such as a protective mask.

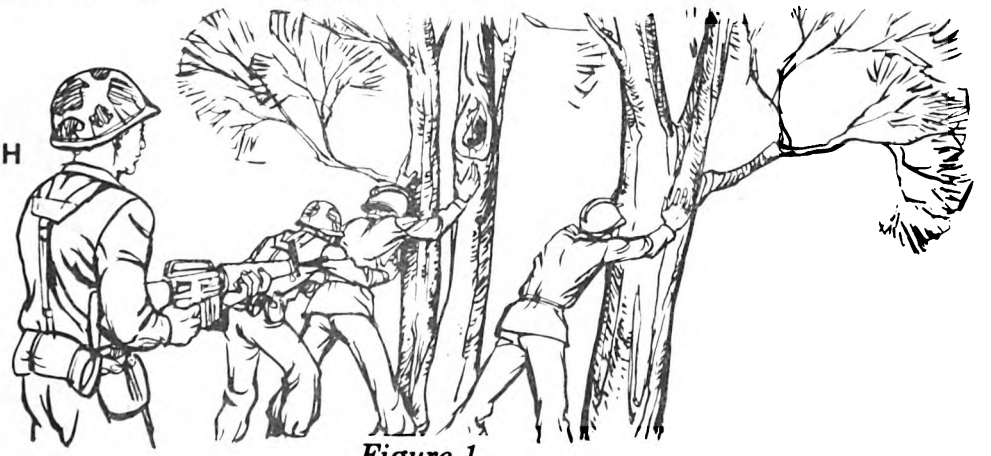

Figure 1.

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2. **SEGREGATE** them into groups (figure 2): officers, noncommissioned officers, privates, deserters, civilians, females, and political indoctrination personnel. This prevents the leaders from organizing for a mass escape and from making the rest of the prisoners security-minded.

Figure 2.

3. **SILENCE** (figure 3) is essential. Do not allow prisoners to talk to each other. This helps to prevent plans of escape.

Figure 3.

4. **SPEED** (figure 4) prisoners to the rear. The information they have does no good until obtained by an interrogator and processed.

Figure 4.

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5. **SAFEGUARD** the prisoners (figure 5) as you take them to the rear. Do not allow anyone to abuse them, but do not allow anyone to give them cigarettes, food, or water.

Figure 5.

6. **TAGGING.** A PW tag should include the capturing unit (a complete unit identification), date and time of capture, place of capture (grid coordinates or reference from a known point), and circumstances of capture (how PW was captured). The same format is used for documents and equipment except that circumstances identify where documents of equipment came from (i.e., from PW Ivan Schmidt, "found on dead enemy soldier", etc.) (figure 6).

NOTE: Tags may be printed before combat or made out of materials at hand on the battlefield.

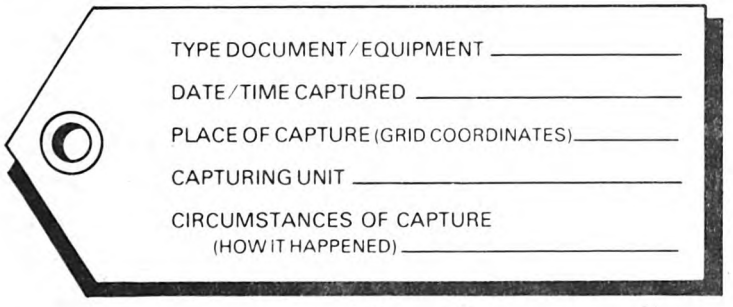

Figure 6.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition TBP)
TEC Lesson 935-071-1028-F, Processing Captured Personnel, Equipment, and Documents

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TASK NUMBER: 071-331-0803

COLLECT/REPORT INFORMATION - SALUTE

CONDITIONS:

Given a tactical situation which includes any number of enemy soldiers, engaged in any type of activity, who can be seen either with the naked eye or with binoculars.

STANDARDS:

Give an oral report to your leader which describes each point of interest expressed by the letters of the key word SALUTE. (Location may be descriptive; need not be grid coordinates.)

PERFORMANCE MEASURES:

1. Report all information quickly, completely, and accurately. The example report below shows how much detail is included in a complete report.

"Seven men in civilian clothes, one carrying rifle and bandoleer, six carrying farm tools, entered the village of Friedberg (BN 223227) by SW gate at 211300 August. Same seven men, all with rifles and bandoleers, left Friedberg by NE gate 211300 August, walking NE on road to Ogau (BN 214230)."

2. A good way to remember how and what to report about the enemy is to use the letters of the word SALUTE.

a. **S - IZE** - The number of personnel seen or size of object.

A - CTIVITY - What the enemy was doing.

c. **L - OCATION** - Grid coordinates or reference from a known point including distance and direction (or azimuth) from the known point.

d. **U - NIT** - Describe any patches or clothing, distinctive signs or symbols, or ID numbers on vehicles.

e. **T - IME** - The time the activity was observed.

f. **E - QUIPMENT** - Describe or identify all equipment associated with the activity.

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3. Both oral and written reports may be accompanied by maps, photos, overlays, sketches, captured documents, enemy materiel, or anything else which may help convey the full meaning of the information you are reporting.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)
TEC Lesson 935-071-1026-F, Collecting and Recording Information

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TASK NUMBER: 071-331-0804

CONDUCT DAY AND NIGHT SURVEILLANCE WITHOUT THE AID OF ELECTRONIC DEVICES

CONDITIONS:

1. **Situation 1:** During daylight, with good visibility to 500 meters or beyond, given an unspecified number of:

a. Improperly camouflaged OPFOR soldiers in fighting positions and temporary battlefield positions at ranges from 30 to 460 meters.

b. Stationary, properly camouflaged vehicles at ranges from 150 to 500 meters.

2. **Situation 2:** At night, with good visibility to 500 meters or beyond, given an unspecified number of:

a. Moving and stationary OPFOR soldiers skylined at not more than 300 meters.

b. Moving and stationary OPFOR soldiers in open and semi-open areas, not on the skyline, at ranges less than 100 meters.

c. Sounds of wheeled and tracked vehicle movement.

d. Sounds of friendly and enemy weapons fire.

STANDARDS:

1. **Situation 1:** Locate 75 percent of all soldiers (positions) and 50 percent of all vehicles.

2. **Situation 2:** Locate 75 percent of soldiers on skyline, locate 50 percent of all soldiers not skylined, differentiate between tracked and wheeled vehicle sounds, and identify all weapons fire as:

a. Heavy machinegun fire.

b. Light machinegun/assault rifle fire.

c. Indirect fire.

d. Rocket/recoilless rifle fire.

PERFORMANCE MEASURES:

1. To conduct a visual search in daylight:

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a. Make a quick overall search of the entire area by quickly raising your eyes from just in front of your position to the maximum range you wish to observe (figure 1). (For a wide area, subdivide and repeat procedure.)

b. Observe overlapping, 50-meter-deep strips of terrain in detail, alternately searching left to right, right to left, etc. (figure 2).

c. Search suspicious spots thoroughly.

2. To identify improperly camouflaged personnel, equipment, and positions, look for:

a. Camouflage/foliage that doesn't match.

b. Failure to replace dead foliage.

c. Failure to obscure outlines.

d. Failure to subdue bright colors/reflections.

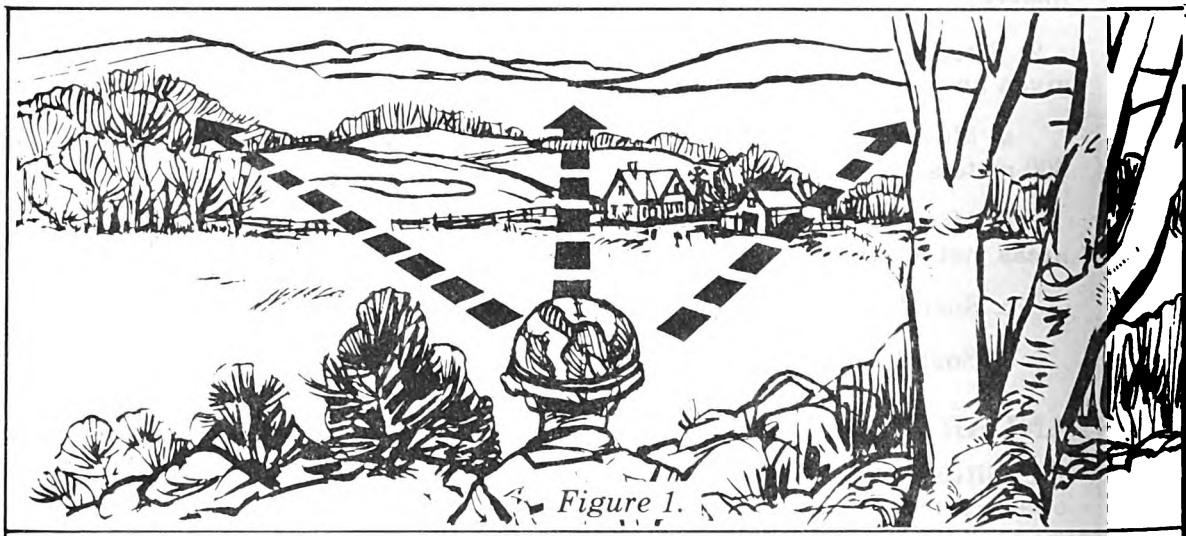

Figure 1.

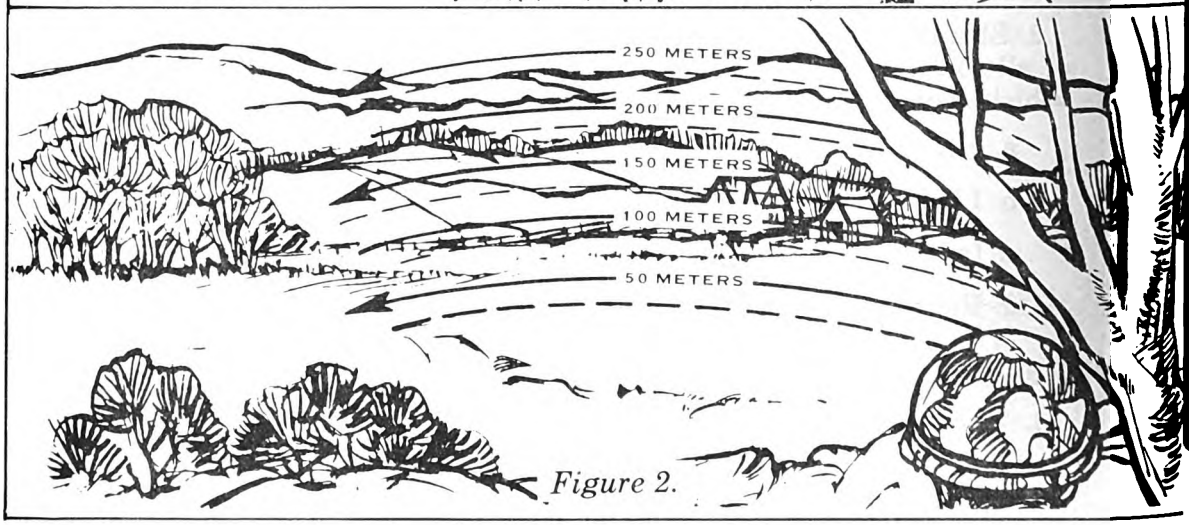

Figure 2.

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c. Off-center vision. To observe specific objects, look slightly to the left, right, above, or below them, by about 6 to 10 degrees (figure 4).

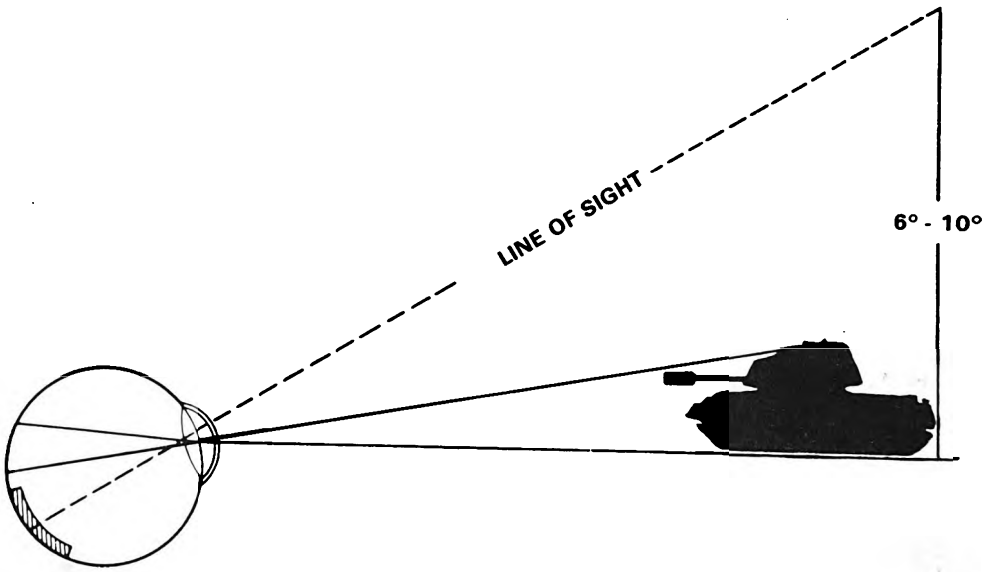

Figure 4.

d. Preserving night vision. When exposed to bright lights, close both eyes. If surveillance must be maintained, close one eye only and observe with the other.

TRAINING TIPS: Since it is hard to tell if the above techniques are being used, frequent training is the only way to insure mastery of this skill. The nature of this task makes it easy to integrate with other tactical training. Maintaining surveillance is one of the basic and critical combat skills. In addition to the training given above, frequent familiarization with the sounds of vehicles and weapons fire, and with various common smells such as gasoline, campfires, deodorants, etc., in a field environment is recommended.

REFERENCE:

FM 21-75, Combat Skills of the Soldier (Revised Edition, TBP)

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TASK NUMBER: 071-331-0805

ENGAGE ENEMY ARMOR WEAK POINTS

CONDITIONS:

Given one of the following weapons: M16A1 rifle, M203 grenade launcher, or M60 machinegun; and a situation in which an enemy tank or APC (without dismounted troops) enters your assigned sector of fire or area of responsibility.

STANDARDS:

Engage the armor threat, causing the armor crew to button up and operate with increased visual deadspace.

PERFORMANCE MEASURES:

1. **Tank Weak Points.** Tank and APC features vary with the different models, particularly in weapons and armor protection, but there are weaknesses common to all armored vehicles.

a. Although tank crewmen are more likely to be injured when exposed, they prefer to keep hatches open and remain exposed until they come under fire because, when buttoned up, the crew must operate with increased visual deadspace. By taking advantage of this visual deadspace, dismounted elements can approach and destroy a tank using numerous antitank devices. A representative diagram illustrating visual deadspace is shown in figure 1.

b. Threat tanks also have external fuel tanks mounted flush with the top of the rear deck. If these have not been dropped, subjecting them to artillery or direct fire hits may cause them to burn.

2. **APC Weak Points.** The same considerations that apply to tanks are applicable; however, an enemy APC can be stopped by engaging it from the sides with either the M60 machinegun or the M203 grenade launcher using the HEDP round. Furthermore, you may engage the rear of the enemy APC and rupture the fuel cells, igniting the fuel and destroying the carrier.

3. **Suppressive Fires.** Suppressive fires are fires, direct and indirect, brought to bear on known or likely enemy locations to degrade the enemy's ability to place effective fire on maneuver elements. Suppressive fires are immediate or planned. Some examples of the use of suppressive fires would be to employ artillery and automatic weapons to force enemy tank crews to button up. The tank is much less effective when it is buttoned up, and the ability of its crew to acquire targets or maneuver the tank is reduced.

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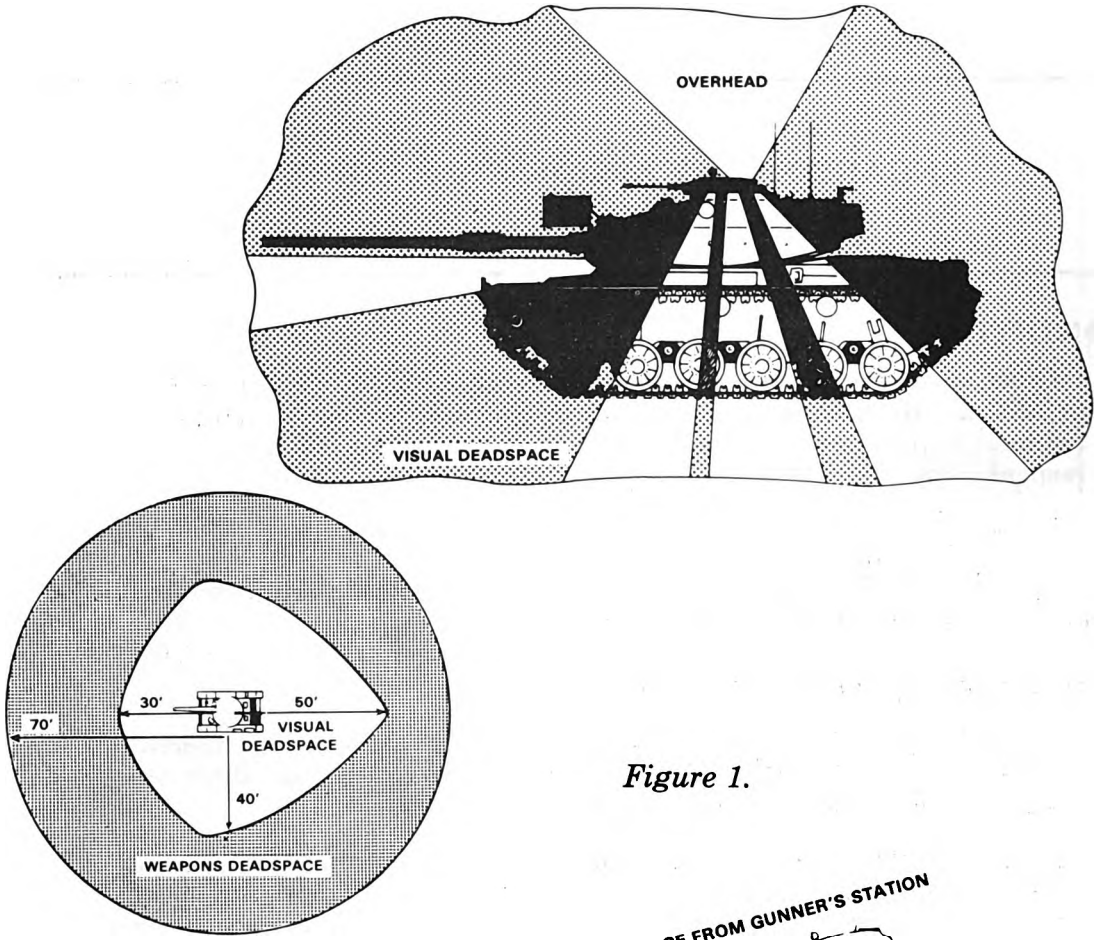

Figure 1.

4. **Suggestions.** To reduce the odds and minimize threat weapon effectiveness:

a. Use terrain to best advantage when moving.

b. Suppress likely enemy positions using a variety of means; tank, APC, artillery, mortar, and aircraft fires.

c. Cover your position with smoke or the threat vehicle's vision by using white phosphorous (WP) or smoke fired by mortars or artillery.

d. Fire at any of the weak points identified in paragraph 1 and 2, above.

REFERENCES:

None

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TASK NUMBER: 071-331-0806

IDENTIFY OPPOSING FORCE (OPFOR) ARMORED VEHICLES

CONDITIONS:

During a field training exercise or in a classroom or suitable area in garrison, given a mockup, model, or photograph of opposing force (OPFOR) vehicles.

STANDARDS:

1. **ALL SOLDIERS.** Identify each vehicle observed as being either friendly or opposing forces.

2. **11B SCOUT OR NCO.** Identify each vehicle observed by NATO nomenclature and state primary combat role of each.

PERFORMANCE MEASURES:

Tank Characteristics.

1. Identification. Tank identification is designed around four areas common to all tanks:

   a. Track and suspension system.

   b. Turret.

   c. Main gun.

   d. Cupola.

2. Track and Suspension System. Many tanks may be recognized by their track and suspension systems. However, recognition by this feature alone is often difficult as the tracks will often be obscured by grass or other objects. To identify the track and suspension system, check to see if it has support or return rollers. Except for the T-10, M-1970, and T-72 tanks, most Warsaw Pact vehicles do not have these rollers.

NOTE: When using this method to help identify tanks, keep in mind that the M551, Sheridan in the US Army also has no return rollers.

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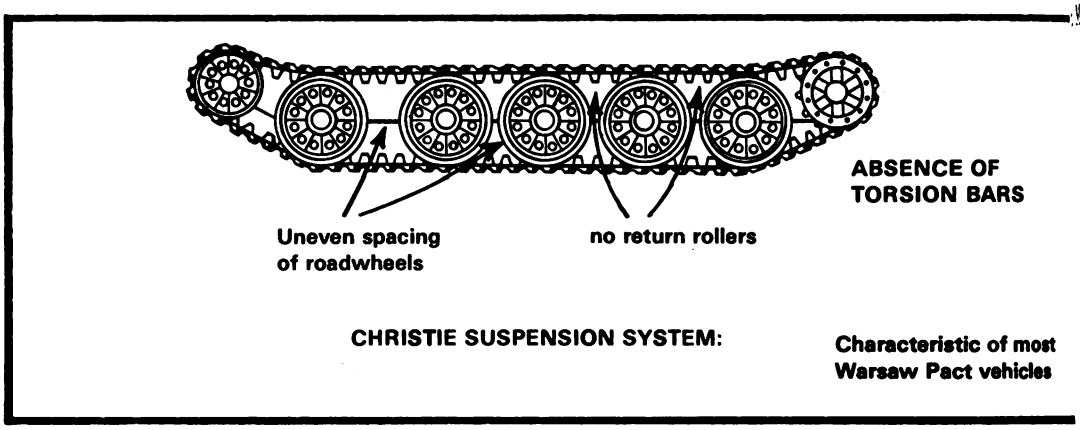
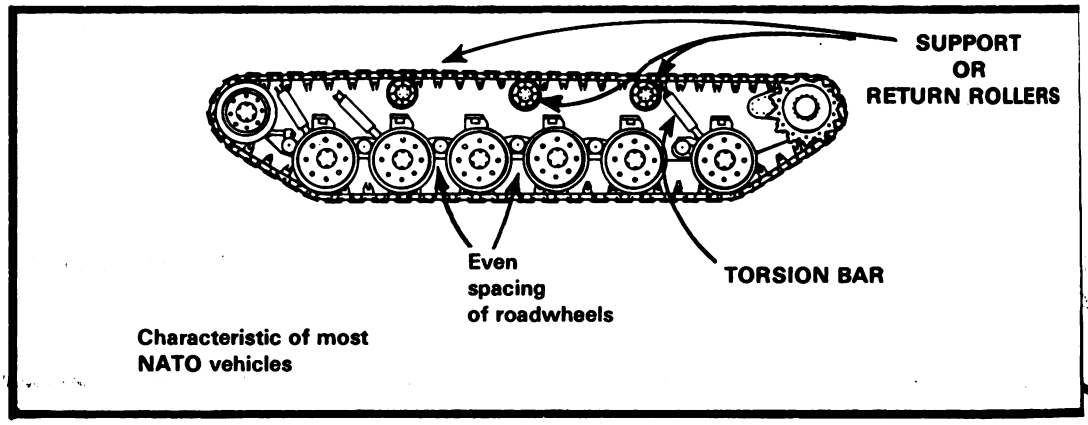
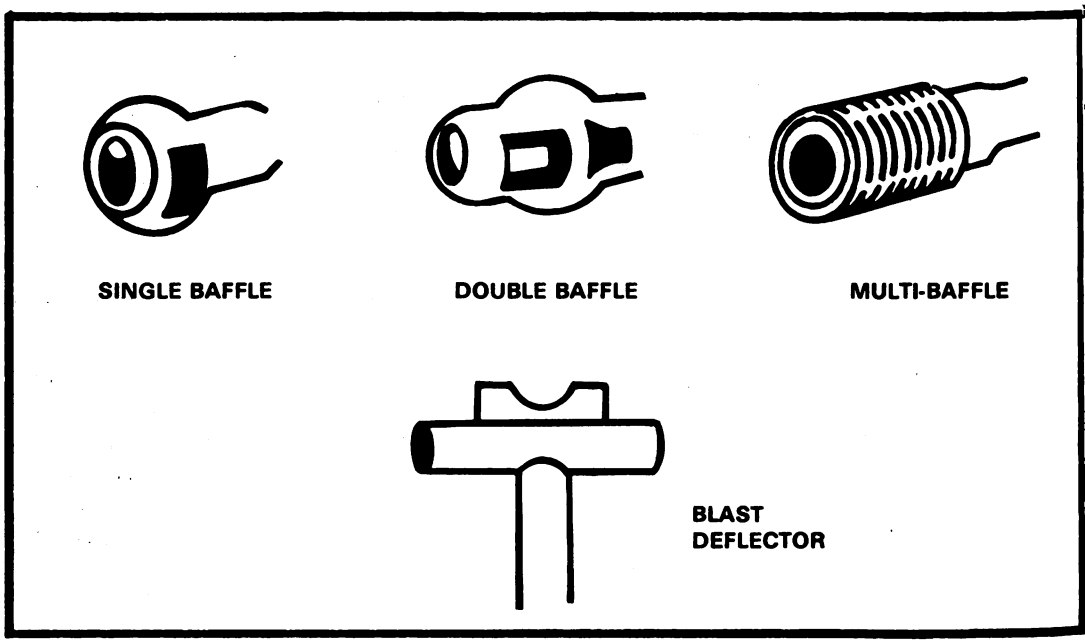




3. Main Gun. Armament varies from machineguns to large cannons. In turreted vehicles, the heaviest armament is normally in the turret. Look for:

a. Muzzle brakes.



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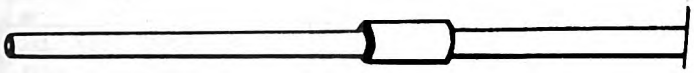
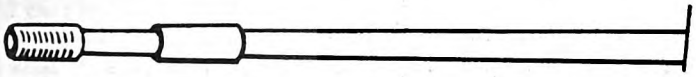
b. Main gun bore evacuator and its location.

MAIN GUN WITHOUT BORE EVACUATOR

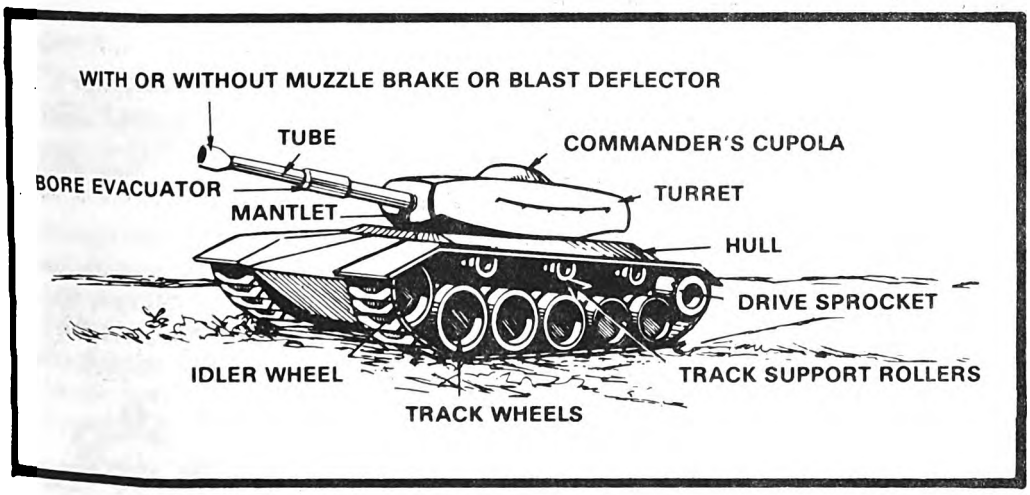


MAIN GUN WITH BORE EVACUATOR



MAIN GUN WITH BORE EVACUATOR AND MUZZLE BRAKE/BLAST DEFLECTOR

Note these common identification characteristics of both friendly and threat tanks:



Tanks. Threat main battle tanks are smaller than the US main battle tank. They have a cruising range of about 300 miles without auxiliary fuel and can attain speeds of about 30 mph. Threat tank fire control is relatively simple compared to that of US tanks. Currently, they mount no rangefinder similar to those on US tanks. Most Threat main battle tanks are equipped with active infrared (IR) night viewing devices, and have a superior underwater snorkeling capability.

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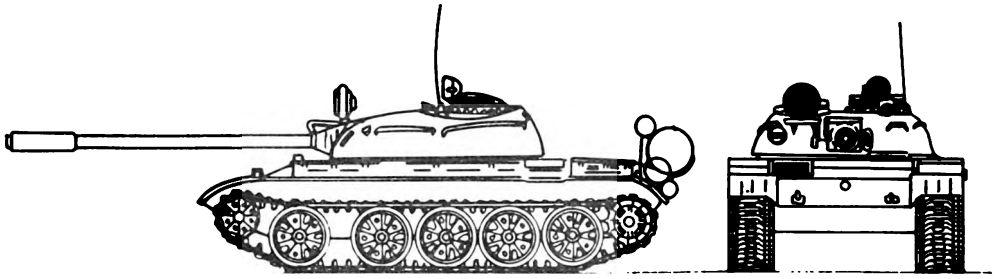
NATO Nomenclature: T-55 Tank



Recognition features: Fully tracked; five-roadwheeled; space between first and second roadwheels; low-silhouetted, sloped hull; dome-shaped turret mounted over third roadwheel; bore evacuator at muzzle; infrared headlights; infrared searchlight for gun; seven variations of this model exist.*

Main gun range: 1,500 meters

Speed: 50 km/hr

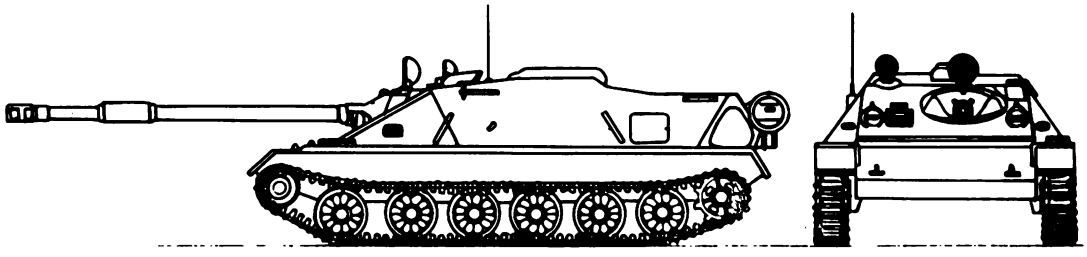
Range: 500 km

Users: India, Israel (with 105mm gun), People's Republic of China, United Arab Republic, USSR, Warsaw Pact

Employment: Medium battle tank in armored formations.

*T-55 and T-55A may mount 12.7mm AA machinegun.

NATO Nomenclature: ASU-85



The ASU-85 airborne assault gun provides armored striking power to airborne forces. Although not amphibious, the ASU-85 chassis is based on that of the PT-76 tank. Its armament is an 85-mm main gun and a 7.62-mm coaxial machinegun. The ASU-85 mounts a large gunner's infrared searchlight above the mantlet and carries a small commander's light.

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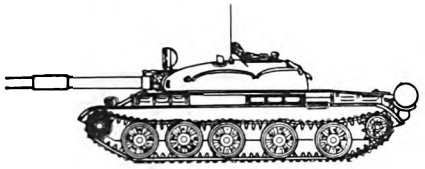
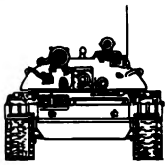
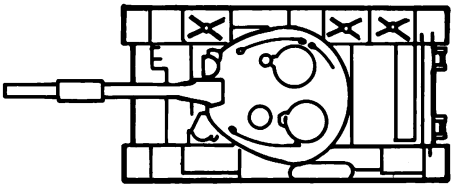
NATO Nomenclature: T-62 Tank

Recognition features: Fully tracked; five-roadwheeled; flat, low-silhouetted hull; dish-shaped turret over third roadwheel; no muzzle brake; bore evacuator three-fourths to muzzle.

Armament: 1 - 115mm main gun
1 - 7.62mm machinegun (coaxial)
1 - 12.7mm AA machinegun

Main gun range: 2,000 meters

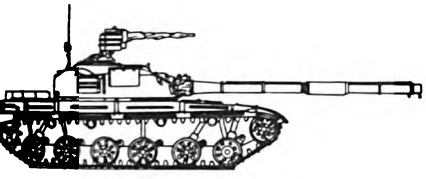
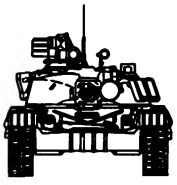
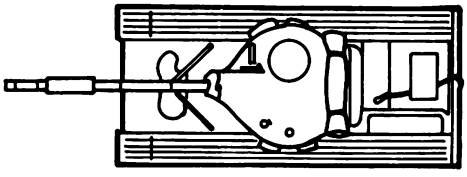
Speed: 50 km/hr

Range: 500 km

Users: United Arab Republic, USSR, Warsaw Pact

Employment: Main battle tank (medium) in armored formations.

NATO Nomenclature: T-72 Medium Tank

Recognition features: Live track, complete with support rollers, centerguides, end connectors, and probable torsion bar suspension. Glacis plate is gently sloping and has a "V" shaped splash guard directly in front of driver's position; external fuel cells down both sides of tank; three equal size storage boxes on lefthand side of the turret, and two unequal size storage boxes on the righthand side of the turret. Main gun has bore evacuator about one-third down the gun tube from the muzzle end.

Armament: 1 - 115mm main gun
1 - 12.7mm AA machinegun (turret roof-mounted)
1 - 7.62mm machinegun (coaxial)

Main gun range: 2,000 meters (approximately)

Speed: 55 km/hr

Range: 500 km (approximately)

Users: USSR

Employment: Main battle tank in armored formations.

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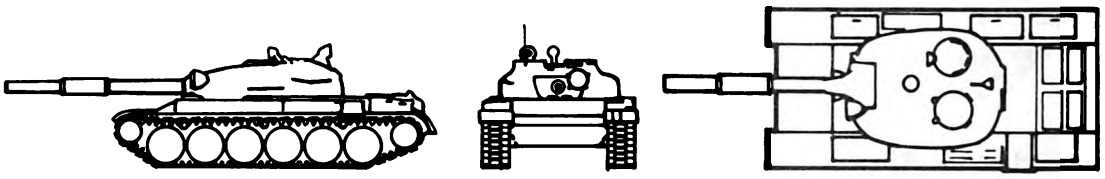
NATO Nomenclature: M-1970 Medium Tank



Recognition features: Six evenly spaced roadwheels; well-sloped glacis plate; infrared unit on left of gun; driver's hatch center-front of hull; commander's hatch right of turret; bore evacuator first third of turret near muzzle.

Armament (probable):
1 - 115mm gun (smoothbore)
1 - 7.62mm machinegun (coaxial)
1 - 12.7mm AA machinegun

Main gun range: 2,000 meters

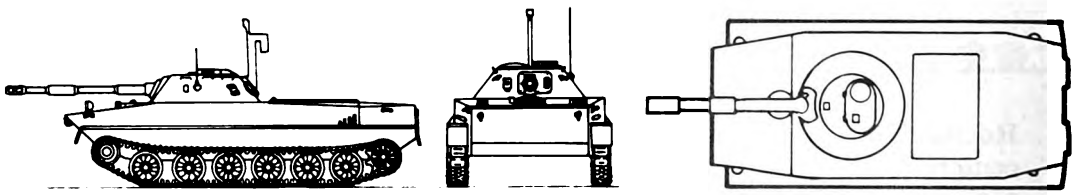
Speed: 60 km/hr (approximately)

Range: 500 km (approximately)

Users: USSR

Employment: Armored formations; possible replacement for T-62.

NATO Nomenclature: PT-76 Amphibious Tank



Recognition features: Fully tracked; six-roadwheeled; rectangular-shaped hull with a boat-like front; dish-type turret mounted over second roadwheel; chassis similar to BTR-50P; muzzle brake on main gun; bore evacuator close to muzzle.

Armament: 1 - 76mm main gun
1 - 7.62mm machinegun (coaxial)
1 - 12.7mm machinegun (AA) (on some versions)

Main gun range: 1,000 meters

Speed: 45 km/hr - land
10 km/hr - water

Range: 250 km

Users: People's Republic of China, United Arab Republic, USSR, Warsaw Pact

Employment: Amphibious reconnaissance tank; personnel movement (up to six plus crew) in maneuver divisions and regiments.

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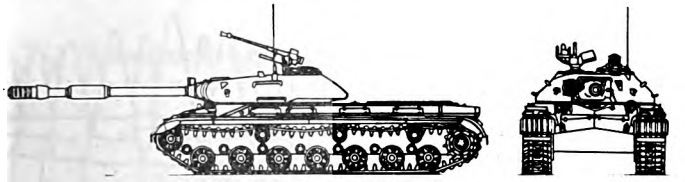
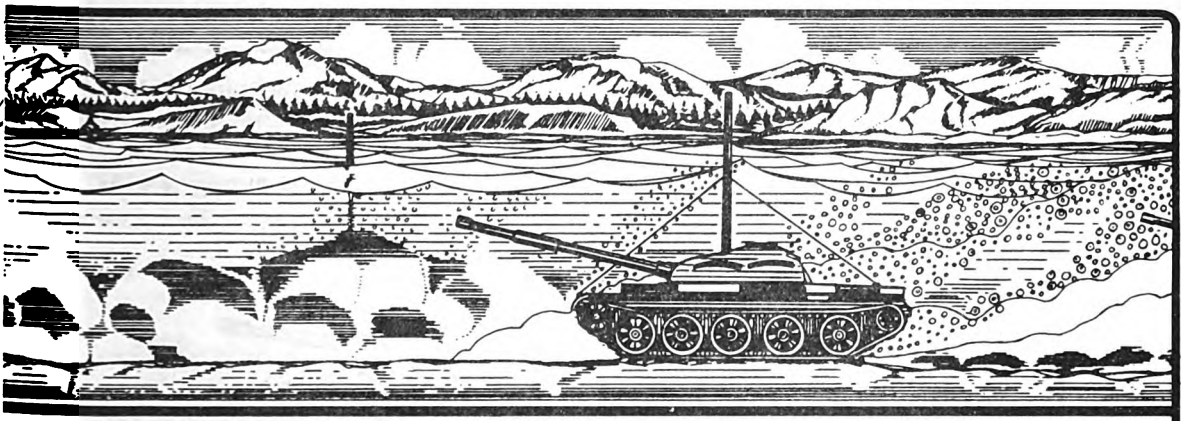
NATO Nomenclature: T-10



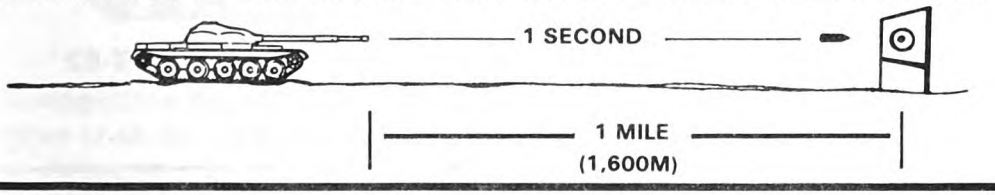
TheT-10 heavy tank is rarely seen in Threat forward areas. This tank stays in the rear and is used in counterattacks or with tank killer units. It is equipped with infrared sights or devices for all crew members, and has seven pairs of roadwheels. Its primary weapon is a 122-mm stabilized gun firing kinetic energy armor-piercing cap and chemical energy high explosive antitank ammunition. It has two 12.7-mm machineguns, one for antiaircraft and another mounted coaxially with the main gun.

Strengths. The strengths of Threat main battle tanks are:

- Low silhouette, which makes them harder to hit.
- Simple fire control, which makes them easier to operate and maintain.
- Infrared night vision devices, which increase effectiveness at night.
- Underwater snorkeling, which permits them to cross water barriers quickly.
- The high-velocity 115-mm APFSDS tank-defeating round, which travels a mile every second. The accuracy of this round gives T-62 tank crews a 50% chance of hitting a stationary target in the open with the first round at ranges to 1,500m, or a moving target traveling at a constant speed in the open at ranges to 1,000m.



THE HVAPFSDS IS THE FASTEST TANK CANNON ROUND IN THE WORLD.



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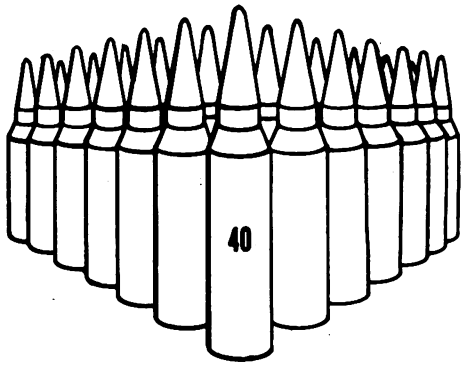
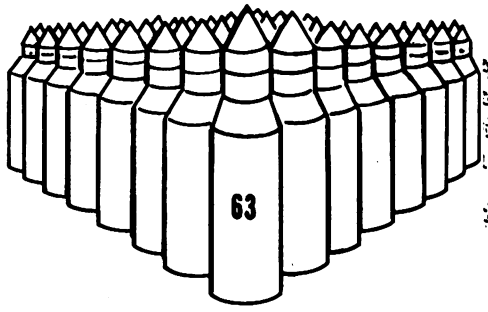
Weaknesses. The weaknesses of Threat main battle tanks are:

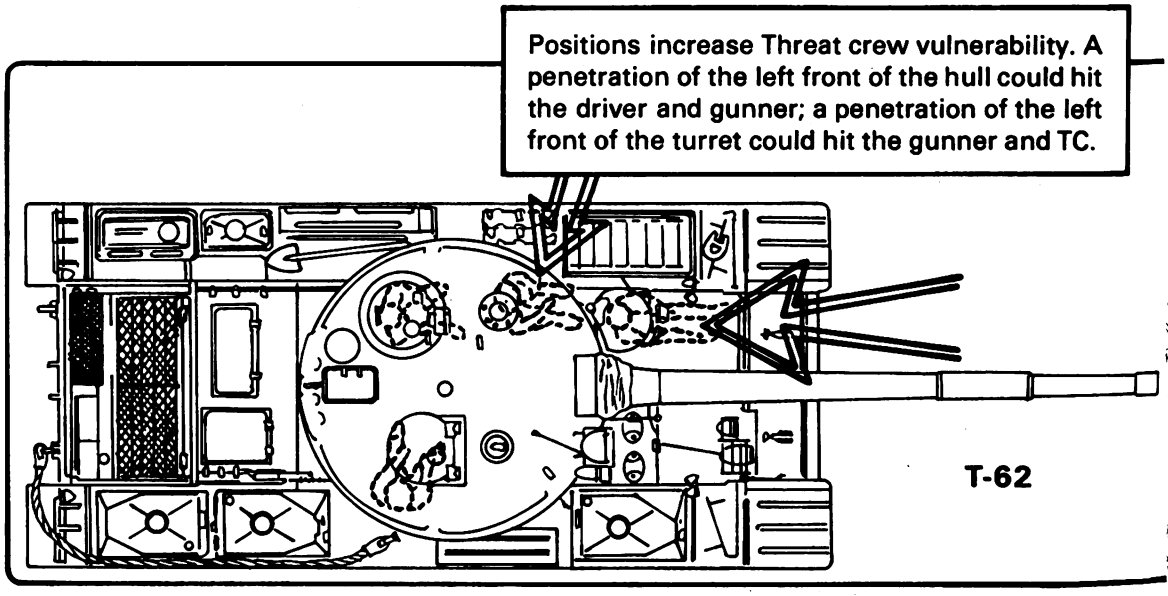
- Threat tank fighting compartments are considerably smaller than those in US tanks. The crew is cramped and freedom to move is restricted. Crew fatigue can therefore be a bigger factor in Threat tanks.
- Smaller turret interior and larger (115-mm) main gun ammunition means that Threat tanks have a slower rate of fire than US tanks.
- Because of its small fighting compartment, the T-62 tank has 23 fewer rounds of main gun ammunition than the M60A1. Therefore, in tank duels Threat tanks may run out of ammunition sooner than US tanks.
- Some main gun ammunition is strapped along the turret walls, and hits above the turret ring may cause secondary ammunition explosions.

T-62



M60A1




Positions increase Threat crew vulnerability. A penetration of the left front of the hull could hit the driver and gunner; a penetration of the left front of the turret could hit the gunner and TC.
T-62

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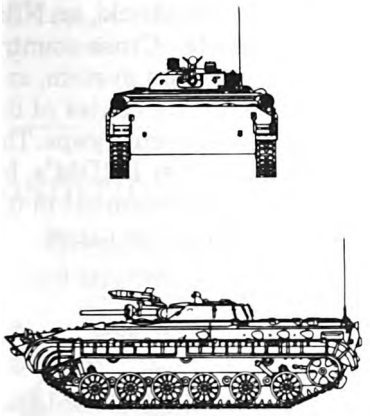
INFANTRY COMBAT VEHICLES

NATO Nomenclature: BMP

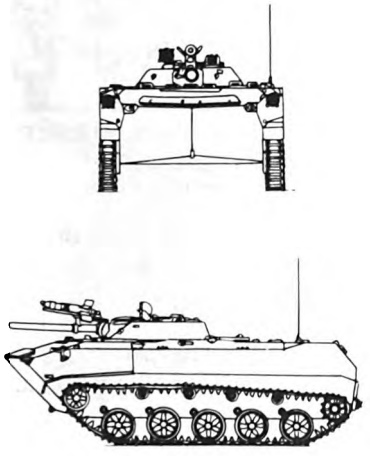


The amphibious BMP is used as both a reconnaissance and an armored fighting vehicle. The armored infantry version of the BMP has a crew of three—gunner, driver, and vehicle commander and has a rear compartment troop capacity of eight. There are four periscopes and firing ports on each side allowing the infantry to fire from inside the vehicle while on the move. Its main armament is a 73-mm smoothbore gun with a Sagger missile rail mounted over the gun. A 7.62-mm PKT coaxial machinegun is mounted on the turret. Each BMP has racks for two Sagger missiles.

Recognition features: Six-roadwheeled, tracked, amphibious, ICV; engine in front; two doors in rear; four hatches in top of crew compartment; low silhouette with flat revolving turret. (May have Sagger mounted above gun.)

Employment: Motorized rifle units.

NATO Nomenclature: BMD



The airborne amphibious combat vehicle, BMD, resembles the BMP. It has five evenly spaced roadwheels on each side and is 5m long. It is air droppable, carries six troops, and has a turret similar to the BMP with a 73-mm gun and a Sagger missile launch rail. The BMD is amphibious and has a water propulsion system similar to the PT-76.

Recognition features: Five evenly spaced roadwheels; turret mounts the same as on the BMP; rear crew compartment, amphibious.

Employment: Motorized rifle units.

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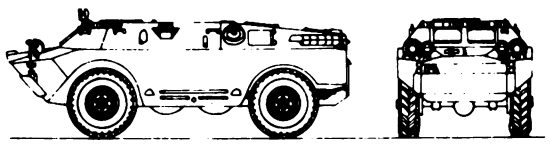
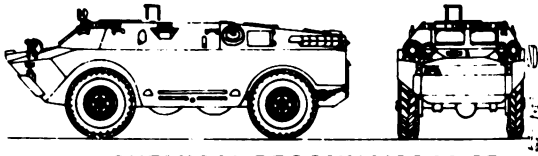
SCOUT VEHICLES

NATO Nomenclature: BRDM-2

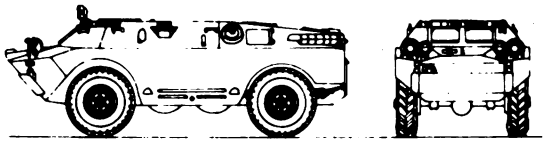
The BRDM-2 is a four-wheel-drive amphibious scout car adaptable for many uses on the battlefield. It can be used as a command vehicle, an NBC test vehicle, an antiarmor vehicle, or an ADA vehicle. Cross-country mobility is improved by a centralized tire pressure regulation system, and by four retractable auxiliary drive wheels located under the center of the vehicle which can be lowered to aid flotation and help in crossing gaps. The rear mounted power plant is improved over that of the first BRDM's. Its armament is a turret-mounted 14.7-mm machinegun. Its armament in the basic reconnaissance car is two machineguns mounted on the turret.



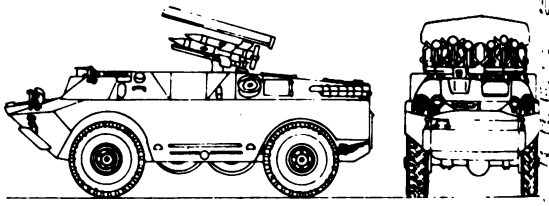
BRDM-2



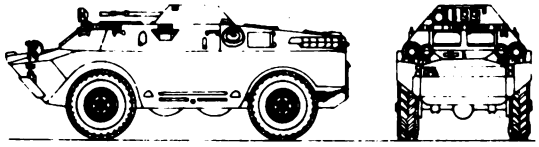
CHEMICAL RECONNAISSANCE VEHICLE



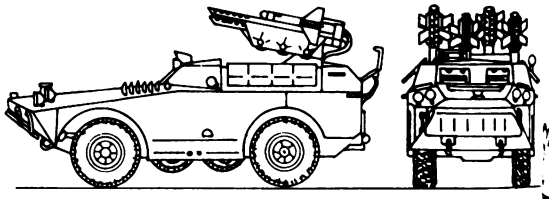
COMMAND VEHICLE



ATGM LAUNCHER



RECONNAISSANCE CAR



ANTIAIRCRAFT MISSILE LAUNCHER

Recognition features: Four-wheeled, amphibious, armored reconnaissance vehicle; has full armored cover; has four small, rough terrain belly wheels that may be raised or lowered when needed.

Employment: As scout car in different variants; can mount Snapper, Swatter, or Sagger At missiles. Two versions: basic BRDM has a 7.62mm machinegun; BRDM-2 has a 14.5mm machinegun.

REFERENCES:

FM 71-1, The Tank and Mechanized Infantry Company Team, Jun 77 (chap 2, pages 2-1 thru 2-12)
TC 30-3, Soviet Equipment Recognition Guide, Apr 75 (pages 25 thru 44)

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TASK NUMBER: 071-331-0808

IDENTIFY OPPOSING FORCE (OPFOR) WEAPONS AND EQUIPMENT

CONDITIONS:

Given a mockup, model, or photograph of OPFOR and NATO weapons and equipment.

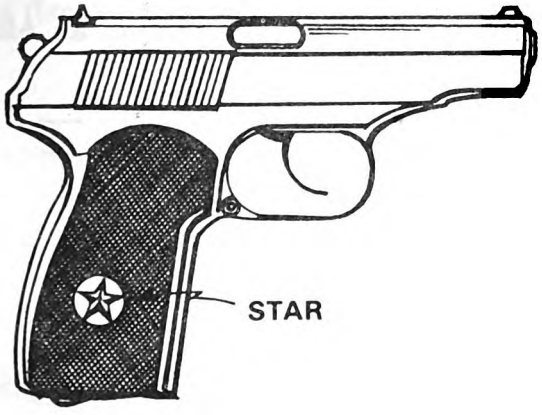
STANDARDS:

Identify each weapon and piece of equipment by NATO nomenclature and as being friendly or Threat.

PERFORMANCE MEASURES:

1. Threat small arms are characterized by their heavy weight and high reliability. Emphasis is placed on simplicity of design for easy training, handling, and maintenance. Their automatic weapons are generally shorter than U.S. models for use from inside APCs.

2. The standard Threat side arm is the 9-mm Makarov Semi-Automatic Pistol (pm), which uses an eight-round magazine (figure 1).



Characteristics:

Length: 106 mm
Weight: 0.81 kg
Effective Range: 50 m
Magazine Capacity: 8 rounds

Identifying features: Star on butt; weapon has a double-action trigger.

Figure 1.

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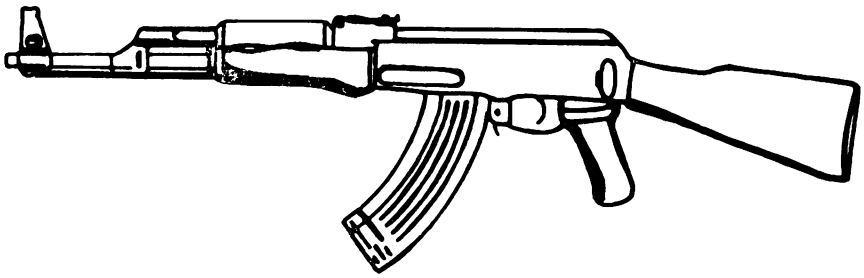
THREAT RIFLES AND MACHINEGUNS

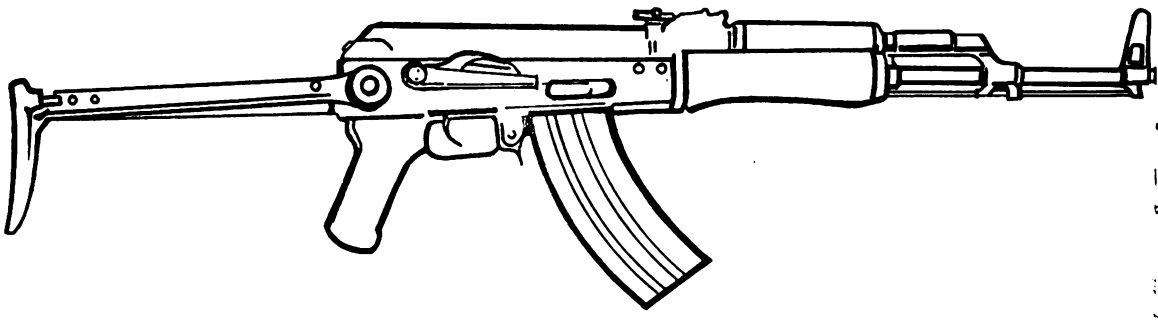
1. **Rifles:**

a. AKM - 7.62-mm assault rifle
NATO Nomenclature: AK (Knashnikov)

Identifying features: Gas cylinder above the barrel.



b. AKMs - This new version has a folding stock:

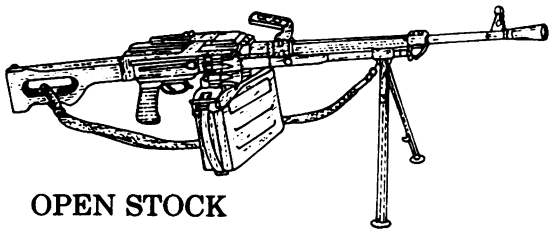


NOTE: Characteristics and identifying features same as AKM except for folding stock.

2. **PK Series 7.62 General Purpose Machinegun:**

NOTE: This machinegun appears in two versions.

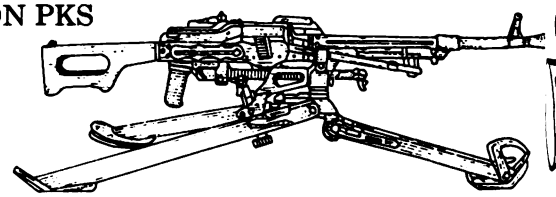
a. The bipod-mounted PK used at the squad or company level.



OPEN STOCK

NATO Nomenclature:
PK general purpose machinegun

GAS CYLINDER
BELOW BARREL
ON PKS



b. The tripod-mounted PKS used as an AA weapon.

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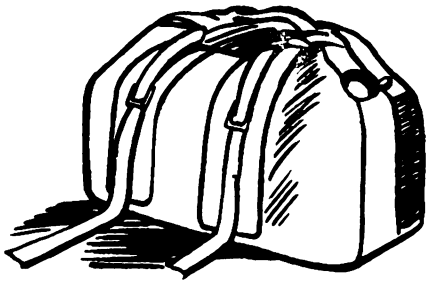
Antitank Guided Missiles. Threat for have deployed two types of ATGMs in la numbers: the Sagger is wire-guided and t invulnerable to electronic countermeasu (ECM); the Swatter is radio-guided a vulnerable to ECM.

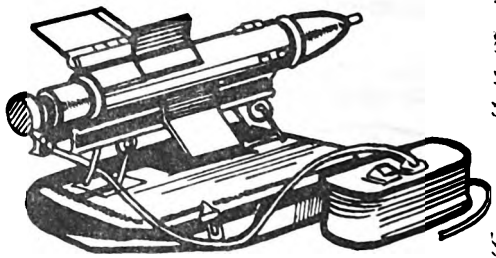
ATGMs are highly accurate to 3,(meters. They are highly mobile and (defeat all known armor.

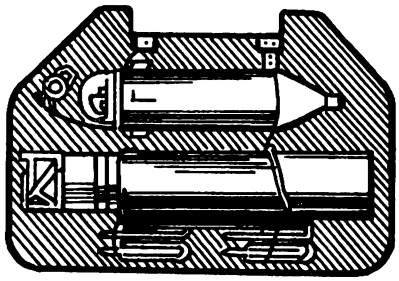
Missiles can be mounted on BMPs, BM BRDM-2s, and helicopters.

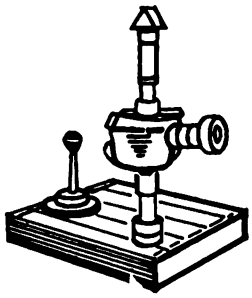
"Suitcase" Saggers can be man-pack and ground-mounted. In this version, Sagger is easily carried by its crew. Its li weight and small size make it easy transport, set up, and camouflage.

NATO Nomenclature: Sagger









The Sagger is a wire-guided antitank missile with an effective range of 3,000 meters. A three-man team carries the portable launcher, the fire control equipment, and two complete missiles. Gunner normally displaces 15 meters from the missile during firing. In flight identification: look for smoke and flare trail.

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Strengths. The main strengths of Threat ATGMs are:

Long-range accuracy and lethality, which permit them to hit and defeat all known armor up to 3,000 meters away.

Versatility of employment, which enables ATGMs to be fired while crewmen are buttoned up and, in the case of the Sagger on a BRDM-2, at a remote position up to 80 meters from the vehicle. The "suitcase" Sagger may be remotely fired from a position up to 15 meters from the launching rail.

Weaknesses. In spite of their reliability, mobility, and long-range effectiveness, Threat ATGMs have weaknesses.

Gunners must have good visual contact with both target and missile during flight. Threat ATGMs are not effective at night. US cavalrymen who move behind cover, obscure themselves by smoke, or conceal themselves in vegetation reduce Threat missile and rocket hit probability. Bushes can break Sagger guidance wires, causing loss of missile control. Trees or heavy brush can detonate an ATGM warhead.

Gunners must be highly trained. Threat ATGM gunners must simultaneously track both target and missile with an optical viewer, while flying the missile with a "joystick" on a control box.

Missiles have a minimum range limitation. The missile has to fly about 500 meters after launch for the gunner to capture it in his viewer and accurately fly it to target. It is also slow moving when compared to the TOW.

ARTILLERY

Threat forces are equipped with a variety of excellent artillery weapons, from light and heavy mortars and conventional field guns and howitzers to multiple rocket launchers (MRLs) and missiles. MRLs can deliver saturation fire, while conventional artillery fires against targets of opportunity and preselected targets.

The most common field pieces are 122-mm and 152-mm towed howitzers. The maximum range of the 122-mm howitzer is 15,300 meters and its rate of fire is 7 to 8 rounds per minute.

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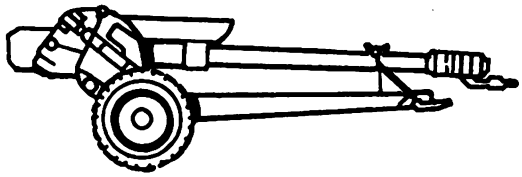
NATO Nomenclature: 122-mm Howitzer, D-30

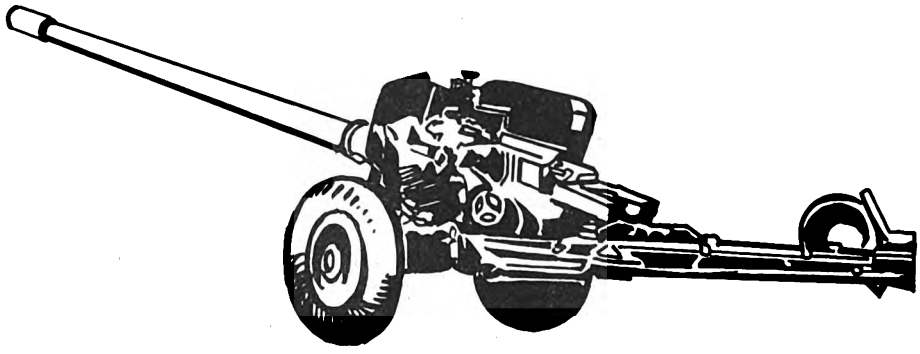


122-mm Howitzer, D-30

Recognition features: Three-trailed configuration; trails fold together and attach to tube for travel; towed by muzzle.

Employment: Direct support of maneuver company or battalion (regimental artillery battery and divisional artillery); weapon should appear 1 to 4 km behind the forward edge of the battle area in offense or 2 to 7 km in defense, depending on unit of assignment.

NATO Nomenclature: 100-mm AT Gun, T-12



100-mm Antitank Gun, T-12/T-12A

Recognition features: Long tube with cylindrical "pepperpot" muzzle brake; single castor wheel near trail ends; winged shield angled to rear on either side, T-12A only; added cylinder to right and above breech.

Employment: Support of maneuver battalion; weapon should appear approximately 0.2 to 0.5 km behind forward edge of the battle area in offense and 0.2 to 2.0 km in defense.

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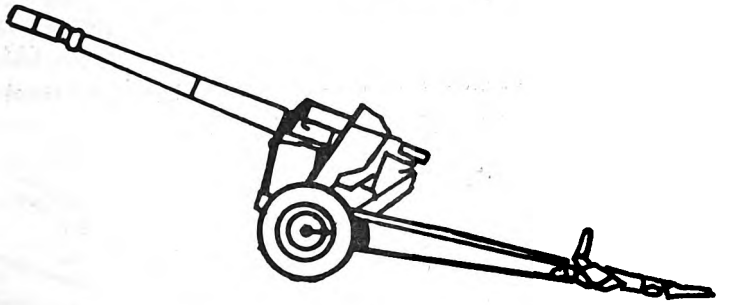
NATO Nomenclature: 152-mm Gun Howitzer, D-20

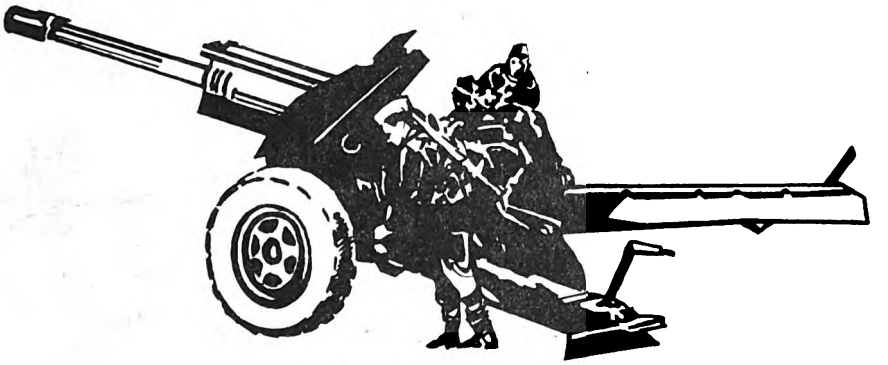


152-mm Gun/Howitzer, D-20

Recognition features: Prominent baseplate connected to bottom forward cradle for travel (same carriage as D-74); castor wheels and jacks at each trail end; scalloped winged shield with traveling central portion; shorter, larger diameter tube than D-74 with similar double-baffle winged, muzzle brake.

Employment: Weapon should appear 3 to 5 km behind the forward edge of the battle area in offense or 4 to 8 km in defense; organic to artillery battalions and regiments.

NATO Nomenclature: 152-mm Howitzer, D-1



152-mm Howitzer, D-1

Recognition features: Essentially same appearance as the 122-mm howitzer, M-30 (M1938) except larger diameter tube and added double-baffle muzzle brake.

Employment: Weapon should appear 2 to 3 km behind the forward edge of the battle area in offense and 3 to 6 km in defense; organic to artillery units at combined arms army/division level.

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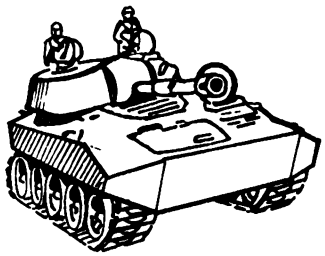
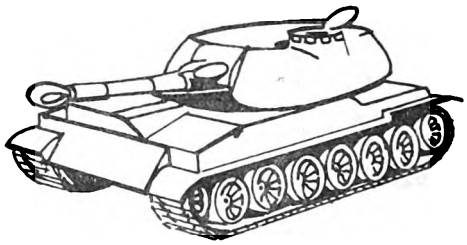
Threat forces have recently been equipped with two new mobile artillery pieces: 122-mm and 152-mm self-propelled (SP) guns. The 122-mm SP gun is mounted on a tracked carriage which resembles the hull of the BMP personnel carrier and running gear of the PT-76 tank. The gun is mounted in a turret with compartments and hatches for both gunner and commander. Not much is known about the 152-mm SP.

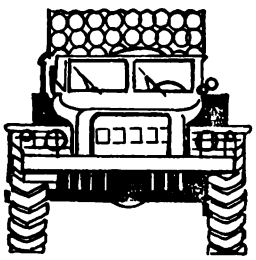


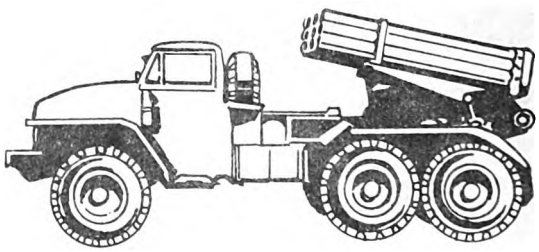
122-mm SP Gun



152-mm SP Gun

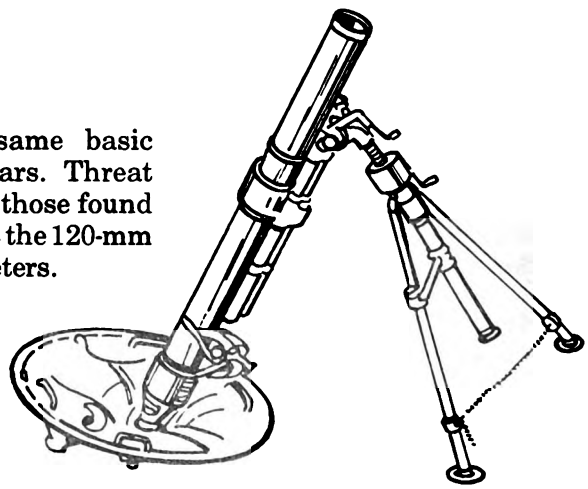
Threat forces usually use the multiple rocket launcher (MRL) for area coverage. These weapons are available in many sizes, but the most common is the 122-mm truck-mounted launcher, which can rapid fire up to 40 rounds at ranges out to 20,000 meters.





122-mm Rocket Launcher BM-21

Threat mortars have the same basic support missions as US mortars. Threat mortars are almost the same as those found in US forces. One of the largest is the 120-mm mortar with a range of 5,700 meters.



120-mm Mortar

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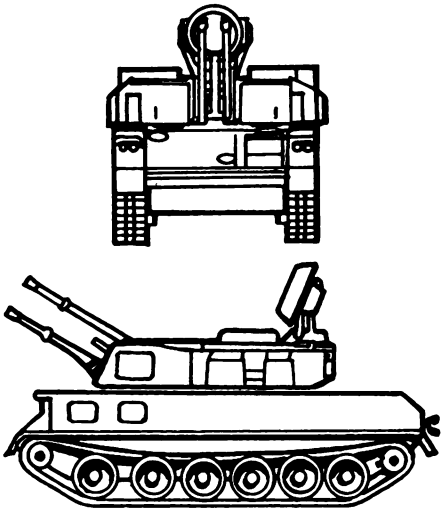
ANTIAIRCRAFT ARTILLERY AND MISSILES

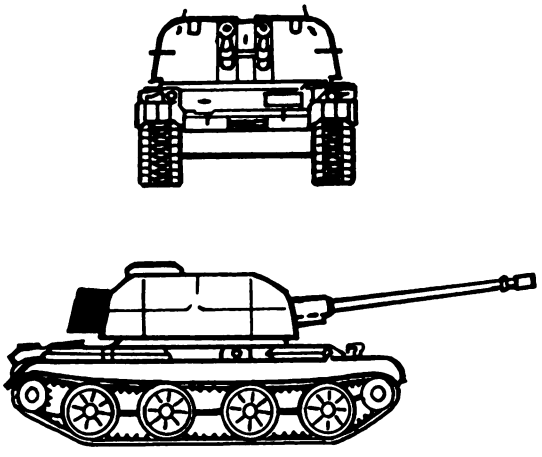
ntiaircraft Artillery. The Threat army has been reluctant to replace its conventional iaircraft guns with more sophisticated surface-to-air missile (SAM) systems. Antiaircraft llery weapons range in caliber from 12.7-mm to 130-mm. Present emphasis is on automatic, id-fire, highly mobile guns and missile systems designed to provide field armies with ctive low-level air defense.



The ZSU-23-4 is a self-propelled system mounting four 23-mm guns with a completely integrated fire control system. The ZSU-23-4 is mounted on a light tracked chassis. Its on-board radar is used for both target acquisition and target tracking. Its four guns fire 800-1,000 rounds per minute, each with a tactical antiaircraft range of 3,000 meters and 2,000 meters without radar. It may be used against aircraft maneuvering to evade low- and medium-level surface-to-air missiles. The sustained rate of fire is 300 rounds per minute per barrel.

Recognition features: Full-tracked, six-roadwheeled vehicle; box-like hull with a rectangular turret centered over the third roadwheel; turret mounts four 23-mm automatic AA guns.

Employment: Located in AD gun battery of motorized rifle and tank regiments; organic to AA regiment of maneuver divisions.



The ZSU-57-2 is used by field air defense units in tank divisions. It consists of a modified T-54 tank chassis carrying a twin S-68 57-mm gun in a large, squarish, open top turret. The chassis has much less armor than the T-54 tank and the running gear uses only four roadwheels. It weighs 28.1 tons. The turret is also identifiable by the large basket on the rear where empty cartridge cases are stored. It can fire 105-120 rounds per minute per gun with a tactical antiaircraft range of 4,000 meters.

REFERENCES:

FM 71-1, The Tank and Mechanized Infantry Company Team, Jun 77 (chap 2, pages 2-13 thru 2-17)
TC 30-3, Soviet Equipment Recognition Guide, Apr 75 (pages 1 thru 18)

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TASK NUMBER: 071-331-0807

ENFORCE NOISE, LIGHT, AND LITTER DISCIPLINE

CONDITIONS:

As the leader of a unit conducting any tactical mission (defense, offense, etc.) during daylight or the hours of darkness.

STANDARDS:

The leader will insure that:

1. Noise is kept at a minimum.

2. No light is visible to the enemy.

3. The area is free of litter and other evidence of the unit's presence.

PERFORMANCE MEASURES:

1. **Noise Discipline:**

a. Avoid unnecessary vehicular and foot movement.

b. Tape or otherwise secure metal parts (weapon slings, canteen cups, ID tags, etc.) to prevent them from making noise when contacting each other. Be careful that restricting moving parts of weapons does not prevent their operation.

c. Talk only when necessary to conduct or plan operations. Use radios only when necessary. Keep volume low so they can be heard only by the operator. Wire communications should be used whenever possible, especially in the defense.

2. **Light Discipline:**

a. Don't allow smoking except when concealed from possible enemy view. Discourage smoking at night; the enemy can see and smell it.

b. If flashlights or other lights are used, they must be filtered and concealed, such as underneath a poncho.

c. Cover anything that shines or glares (metal surfaces, vehicles, glass, etc).

d. Use all available natural concealment and camouflage vehicles, equipment, etc.

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3. **Litter Discipline:**

a. When occupying fixed positions, establish collection points for disposal of empty food containers, empty ammo boxes, old camouflage, dirt from defensive positions, etc. During movement, carry litter until it can be disposed of without leaving any trace.

b. Conceal unused equipment from enemy view.

REFERENCES:

FM 21-75, Combat Skills of the Soldier (TBP)
TEC Lesson 935-071-1029-F, Counterintelligence

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TASK NUMBER: 071-331-0809

EMPLACE AND RECOVER FIELD EXPEDIENT WARNING DEVICES

CONDITIONS:

In daylight, given:

1. Used C-ration cans, used ammunition boxes, or other discarded metal containers.
2. Used small arms ammunition, pebbles, or other small, hard objects.
3. A location for a defensive position.
4. Barrier wire, WD-1 communication wire, or similar wire.
5. A suspected route of enemy advance or well-defined avenue of approach.
6. Thirty minutes to complete emplacement.

STANDARDS:

Within time specified, the devices must meet the following specifications:

1. **Security** - Devices must be securely attached to either barrier wire or WD-1 communication wire, etc., along a known or suspected route of enemy advance.

2. **Concealment** - Devices must not be readily observable by an enemy approaching at night.

3. **Forewarning** - Devices must produce sufficient noise to warn personnel in defensive position of enemy advancing toward their position.

4. **Simplicity** - Devices that could be used by the enemy against you must be easily removable upon leaving defensive position.

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PERFORMANCE MEASURES:

1. Components. Field expedient warning devices are limited only by your imagination. Four basic components are needed.

a. Container (C-ration can, metal ammunition box, or any other metal container without a bright, shiny finish).

b. Noise-maker (pebbles, stones, brass ammunition casings, or any other small, hard objects which, when put in the container, will make a noise when the container is shaken).

c. Tripwire (WD-1, barrier wire, or any similar wire).

d. Attachment device (a small piece of wire, string, cloth, etc., to tie container to tripwire).

2. Construction.

a. Cut holes in the side(s) and bottom of the container (to reduce wind resistance and allow water drainage). If container has a bright, shiny finish, paint it with a subdued color (OD, brown, flat black) or cover it with mud (if only mud is available, consider using a different container).

b. Attach container to tripwire. If a wire barrier is in place, use it; if not, string tripwire across likely avenue of approach at knee level or below. Attach container at a spot where natural vegetation will conceal it from enemy detection.

c. Place noise-making objects in container.

d. Take a position at a defensive listening post and have another squad member brush against the wire holding the cans, to make sure you can hear the noise produced.

3. Recovery. Before leaving defensive position, recover devices that could be used by the enemy against you.

REFERENCES:

TEC Lesson 952-061-0050-F, Expedient Early Warning Devices, Part 1
TEC Lesson 052-061-0051-F, Expedient Early Warning Devices, Part 2

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TASK NUMBER: 071-331-0810

EMPLACE/RECOVER PYROTECHNIC EARLY WARNING DEVICES

CONDITIONS:

Situation 1: Given an M49A1 trip flare (either live or inert) and a designated area for employment of an early warning device.

Situation 2: Given WD-1/TT field wire or string, an M3 pull release training device (either live or inert), nonelectric blasting cap, crimpers, and a designated area for employment of an early warning device.

STANDARDS:

1. Installing Devices:

a. Install trip flare (M49A1) or M3 firing device so that the devices are firmly attached in place across designated area.

b. Arm devices so that anyone moving the trip wire/string will make the device go off.

2. Removing Devices:

a. Remove trip flare by first reinserting the safety pin and then reversing installation procedures.

b. The M3 (live) is dangerous to disarm. It should be blown in place. If the device must be disarmed, proceed as outlined in the performance measures below.

PERFORMANCE MEASURES:

1. **General.** Trip flares and M3 firing devices with trip wire are employed extending across any trail approaching from the direction of enemy main forces, allowing for maximum observation of trail from friendly positions. Typical employment sites may have the following characteristics:

a. A narrow trail approaches from the direction of enemy main forces; it is about 100 meters forward, and is near the adjacent friendly unit.

b. Two routes in open terrain approach your position directly; each route is about 10-15 meters wide.

c. A narrow wash approaches to within 10-15 meters of a listening post.

d. A narrow trail, approaching from the direction of bypassed enemy.

2. **To Emplace an M49A1 Trip Flare:**

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a. The location chosen for installation of the flare and trip wire should be in the logical path of infiltrating troops and so positioned that the field toward the enemy will be illuminated and friendly defense positions will not be disclosed.

b. In most instances, it is easier to install the flare using the pullpin method, because the amount of slack in the trip wire is less critical. Also, the trip wire may be installed to the left or right of the flare.

c. To mount bracket by nailing, use two of the nails provided. The bracket must be as vertical as possible and at a height of 15 to 18 inches above the ground.

d. To mount flare, aline lever with trigger pivot.

e. Carefully slide flare downward into its bracket until bottom edge of lever is no more than 1/16 inch above -- but not past — the bracket. In this position, note that the flare base is approximately 1/2 inch below the upper carriage bolt. The bottom end of lever is approximately 3/8 inch below the bracket prongs and is centered between these prongs (figure 1).

NOTE: If the flare is positioned below the slot, in the bracket, the lever will not be free to move for proper arming. If the lever is not alined with the trigger pivot and centered between the prongs, the lever will not be free to move for proper arming.

f. Clamp flare in its bracket by tightening upper wingnut with sufficient force to grip flare firmly.

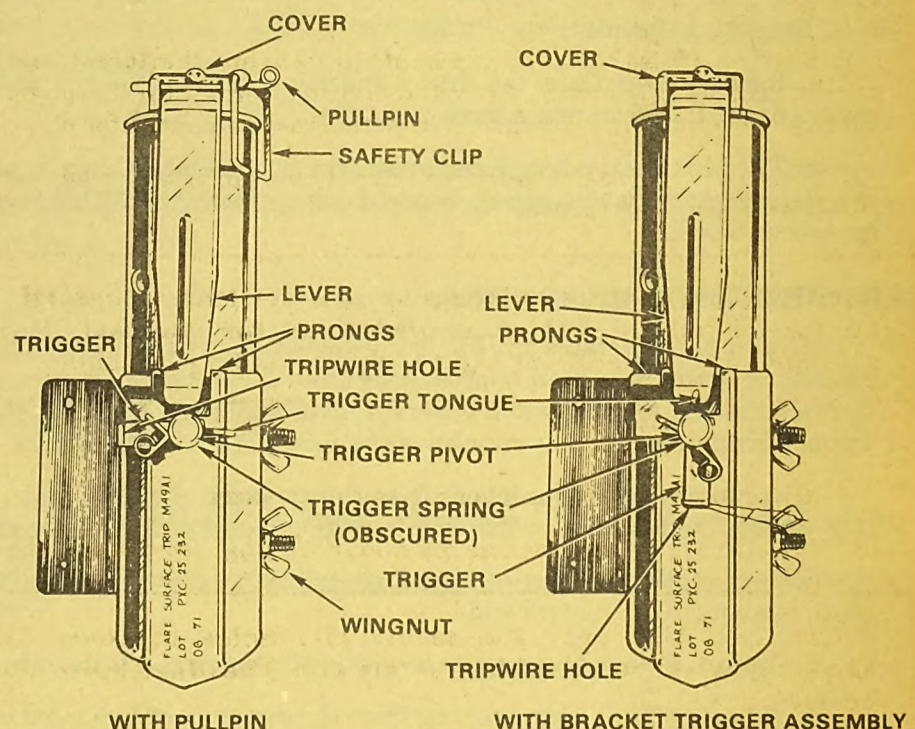

Figure 1.

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3. **To Arm the M49A1 Trip Flare Using the Pullpin Method:**

a. Fasten one end of trip wire to a post, stake, or other rigid object, at the desired distance (usually 40 feet) from flare and to the right or left of flare when facing flare trigger.

WARNING: Do not release lever when pressing it down in 3b below, because release of lever will cause flare to function.

b. Press lever down with one hand and move safety clip assembly.

c. While still holding lever, insert pullpin, which is attached to safety clip, through two safety clip holes of cover loading assembly.

WARNING: Before releasing lever in 3d below, make certain pullpin will hold in safety clip holes.

d. Carefully release hold on lever. Make certain pullpin is retained in safety clip holes by lever.

e. Pull loose end of trip wire taut and fasten it to loop in pullpin.

f. Check to see that the trip is taut and tightened at both ends.

g. Flare is now prepared for firing. Sufficient pressure applied to trip wire will pull safety from flare.

4. **Misfire of the M49A1.** In case of failure to fire, the flare should not be approached for 5 minutes. After the waiting period, the flare should be removed carefully and forwarded to authorized personnel for disposal.

5. **Recover Flares Prepared for Use but Not Used.** Follow procedures below to disarm.

WARNING: Any flare having a loose cover loading assembly will be forwarded to authorized personnel for disposal. Make no attempt to reassemble or tighten cover loading assembly.

a. Disarming.

(1) Carefully depress lever against flare body.

(2) If pullpin was used as method of arming, remove pullpin.

WARNING: Use only the safety clip holes in cover loading assembly when reassembling safety clip. The other holes must not be used.

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(3) Secure lever by inserting one end of safety clip through one of the safety clip holes of cover loading assembly; snap other end of safety clip into other safety clip hole.

(4) Detach wire from pullpin.

(5) Return flare to its original packing.

c. Inspection. Prior to returning flare to storage, perform an inspection.

6. **To Emplace a M3 Pull Ring Firing Device.**

a. Functioning.

(1) Pull method. A pull 6 to 10 pounds on taut trip wire will cause device to fire.

(2) Tension-release method. Release of tension (cutting of taut trip wire) will cause device to fire.

b. To Install the M3 Firing Device (figure 2).

(1) Remove protective cap.

(2) With crimpers, attach blasting cap to standard base. *Crimper jaws should be placed no farther than 1/4 in. from open end of blasting cap.*

(3) Attach firing device assembly to anchor (must be firm enough to withstand pull of at least 20 pounds).

(4) Secure one end of trip wire to anchor and place other end in hole in winch.

(5) With knurled knob, draw up trip wire until locking safety pin is pulled into wide portion of safety pin hole.

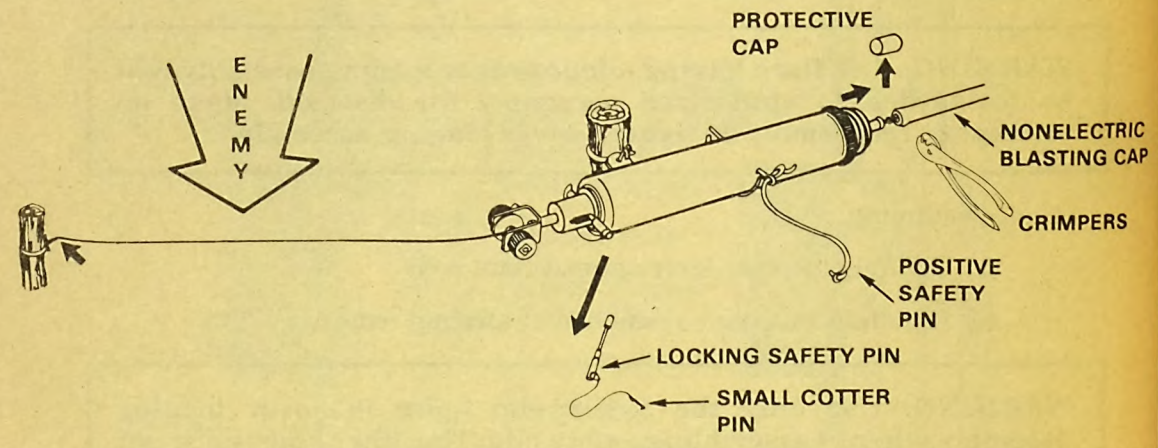

Figure 2.

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c. Arming.

(1) With cord, remove small cotter pin from locking safety pin and withdraw locking safety pin. If it does not pull out easily, adjust winch winding.

(2) With cord, pull out positive safety pin. This should pull out easily. If not, disassemble and inspect.

d. Disarming.

(1) Insert length of wire, nail, or cotter pin in positive safety pin hole.

(2) Insert length of wire, nail, or safety pin in locking safety pin hole.

(3) Check both ends and cut trip wire.

(4) Separate firing device from charge and return firing device to its container.

NOTE: Insert positive safety pin first. Cut trip wire last.

REFERENCES:

FM 5-25, Explosives and Demolitions, Feb 71 (chap 1, sec VI, pages 1-36 thru 1-37)
FM 5-34, Engineer Field Data, Sep 76 (chap 3, sec I, page 46b)
FM 20-32, Mine/Countermine Operations at Company Level, Nov 76 (app D, page 153)
TM 9-1345-200, Land Mines, C1, 3, 5, 6 and 7, Jun 64 (chap 5, page 107)

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TASK NUMBER: 071-331-0811

EMPLACE/RECOVER ELECTRONIC ANTI-INTRUSION DEVICES

CONDITIONS:

Given a patrol seismic intrusion device (PSID) detector unit (in storage), an area for emplacement of the PSID, a detection range setting, and a PSID receiver and receiver operator in the area of emplacement.

STANDARDS:

1. Within 8 minutes, emplace the PSID IAW the performance measures for emplacement.

2. Within 5 minutes, recover the PSID and return to storage configuration IAW the performance measure for recovery.

PERFORMANCE MEASURES:

1. **Unpacking** (figure 1).

a. Remove the detector sets and receiver sets from the carrying cases and remove the clips which are over the end of each unit. Remove the geophone from the clip on the detector, and unwrap the geophone cables. Remove the headset and headband from the carrying case. Connect the headset cable to the receiver set.

b. Inspect each unit for damage (e.g., broken antenna, cracked case, damaged cable). If any damage exists, either repair or reject the unit.

c. Remove the batteries from their shipping carton. Place the ON/OFF sensitivity switch on the detector sets in the OFF position, and the ON/OFF switch on the receiver set in the OFF position. Install the batteries in the detector sets and the receiver set. Place 10 spare batteries in the alarm set carrying case.

d. Make sure that all detectors of the alarm set are marked with the same RF frequency as the receiver. All four pulse codes should be present. The units with the wrong frequency or pulse code will be taken from the alarm set and returned to supply.

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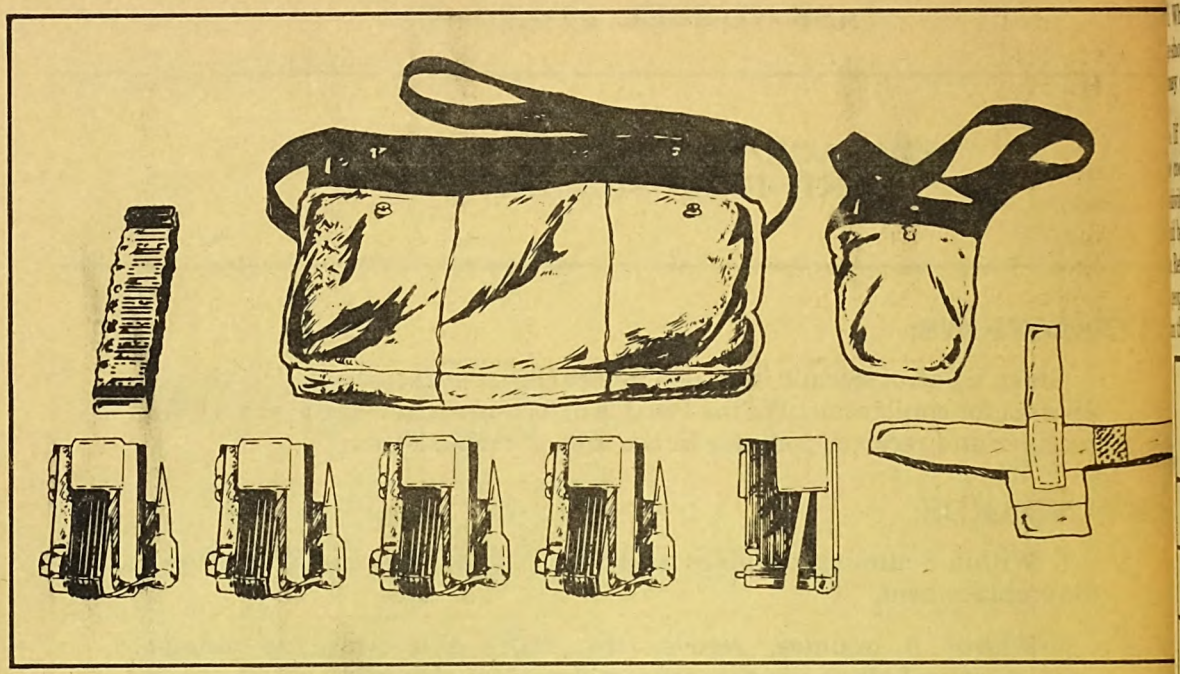

Figure 1. Alarm set, anti-intrusion (PSID).

2. **Preparation and Checkout.**

a. Select a suitable location for the checkout area. The conditions of this area should be similar to those of the actual use area.

b. Select one of the detector sets and notice the pulse code marked on the detector case. Emplace the detector set in the checkout area as shown in figure 2. The receiver operator should be 4 to 5 meters (13 to 16 feet) from the detector set.

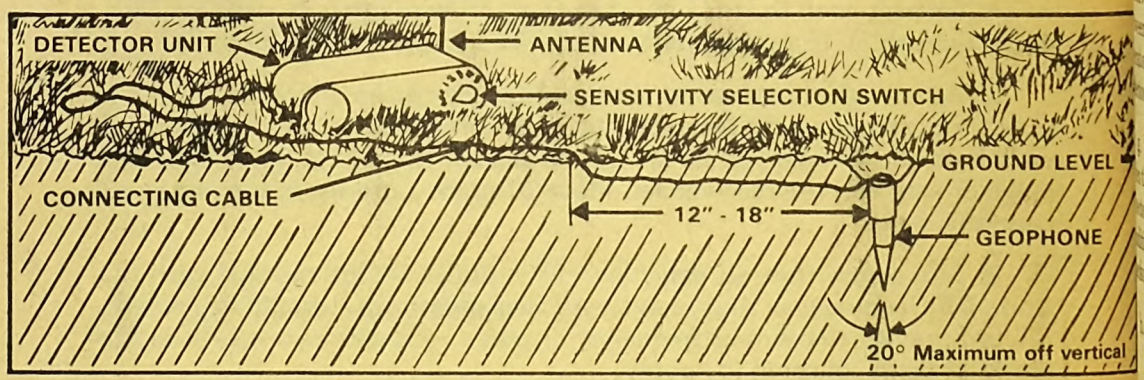

Figure 2. PSID emplacement.

c. Turn the detector ON/OFF sensitivity switch to position number one (1), and the receiver ON/OFF switch to the ON position. If the detector operator does not move, the receiver operator should not hear a signal. If the receiver operator does hear a signal, either there is excessive background noise in the checkout area or the detector set is defective.

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d. When the detector operator moves within the radius of the detector range shown in figure 3, the receiver operator should hear a signal. **NOTE: He may or may not hear a signal for each movement.**

e. If the receiver operator hears a signal or signals which match the pulse code marked on the detector set, the position of the ON/OFF sensitivity switch and the distance between the detector set and receiver set should be noted for proper setup when the detector is deployed in the use area. Return the ON/OFF sensitivity switch to the OFF position. Remove the geophone from the ground. Wipe the case and geophone clean; then return the detector set to the carrying case for move to the use area.

ON/OFF SENSITIVITY SWITCH POSITIONS	PERSONNEL MOVEMENT RANGE
OFF	0 feet 0 meters
1	8 feet 2.6 meters
2	15 feet 4.9 meters
3	50 feet 16.5 meters
4	70 feet 23 meters
5	130 feet 43 meters

Figure 3. Detector sensitivity range.

f. If the receiver operator does not hear a signal, set the ON/OFF sensitivity switch to the next higher position and/or decrease the distance between the detector set and receiver set as necessary until the receiver operator hears a signal or signals matching the pulse code marked on the detector case, and repeat paragraph 2e.

g. In all cases, select the switch setting which allows no false signal when the detector operator is not moving, but which gives a signal when the detector operator moves within the detector sensitivity range. If both conditions cannot be met, select the nearest approximations or relocate the checkout area to a location with less background noise.

h. Repeat the preceding procedure for each of the detector sets.

3. **Emplace the Detector Sets.**

a. The detector sets will be emplaced as shown in figure 2. The deployment location should be one which has a low level of background noise (background noise is defined as any undesired vibration within the sensitivity range of the detector set, such as high winds, rain, low-flying aircraft, and similar sources of ground disturbances). Some areas which present high levels of background noise would be airfields, heavily traveled

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roadways, heavily congested areas, and roadways with heavy vehicles traveling as much as a mile from the detector set. Background noise of a sufficient level could cause the detector set to transmit meaningless signals indicating movement in an area where there is none.

b. Remove the plastic storage clip from the PSID unit.

c. Unclip the geophone and unwind the connecting cable and antenna. Slide the plastic clip back over one end of the detector unit so it will not be mislaid.

d. Push the geophone straight down into the ground (no more than 20 degrees off vertical or it will not work). Do not drive the geophone into the ground by striking it with a hard object or stamping on it. Loosen the soil with an intrenching tool, stick, or other sharp object, if necessary.

e. Bury 12 to 18 inches of the connecting cable adjacent to the geophone. This cuts down on the possibility of cable movement activating the geophone. (See figure 2.)

f. Position the detector unit on the ground, being sure the antenna is not in contact with any wet foliage that might ground it.

g. Set the sensitivity selection switch for the detection range you have been given.

h. During daylight hours, camouflage the detector unit and connecting cable with dry twigs and weeds. This is not usually necessary at night.

4. **Geophone.** The geophone senses the movement of personnel and vehicles in the area of the detector. The detector in turn transmits a message until the movement is outside the detector's sensitivity range. If it is desirable to establish the direction of movement, the detectors can be arranged in such a manner where movement from one detector range into another detector range will indicate the direction of travel. Under ideal conditions, the transmitted signal from the detector set will be received a maximum of 1 mile (1852 meters).

5. **Receiver Set.**

a. The two acceptable configurations in which the receiver set may be utilized are shown in figure 4. In the configuration (a), the receiver may be placed on a table, the ground, or held in the hand. The antenna should be free of any obstruction. In configuration (b), the receiver may be placed in the shirt pocket. **CAUTION: The antenna should be on the side away from the body to avoid the possibility of malfunction or poor reception due to body perspiration.**

b. When the receiver picks up the transmitted signal, it converts it to a pulsed audio tone which is heard through the headset. An experienced receiver operator will be able to determine which detector is transmitting by the tone, as well as the number of pulses. In place of the headset, a small speaker of the proper impedance may be used, or an amplifier with the proper input impedance may be used in conjunction with the receiver set.

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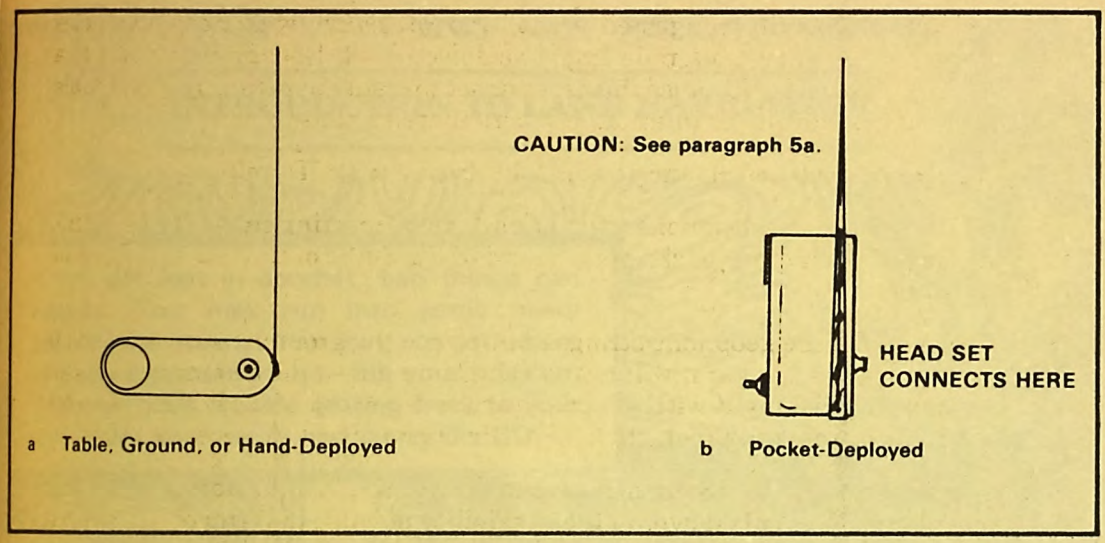

Figure 4. Receiver configuration while in use.

6. **Recovering the PSID.**

a. Locate the detector unit and turn the sensitivity switch to the OFF position.

b. Trace along the connecting cable and gently uncover the buried cable until you get to the geophone.

c. Dislodge the geophone by grasping it, not the connecting cable, and pulling it loose.

d. Remove the storage clip and brush all dirt and debris off the equipment.

e. Rewind the antenna around the detector unit, wrap the cable around the unit, clip the geophone into the holder, and fasten the plastic storage clip over the wire and antenna.

REFERENCES:

TM 5-6350-249-12, AN/GSO-151, Alarm Set, Anti-Intrusion Restricted Area (PSID), C1, Dec 69 (sec I, II, and III, pages 1-1 thru 3-3)
TEC Lesson 952-061-0054-F, Early Warning Devices: Electronic, Part 1
TEC Lesson 952-061-0055-F, Early Warning Devices: Electronic, Part 2

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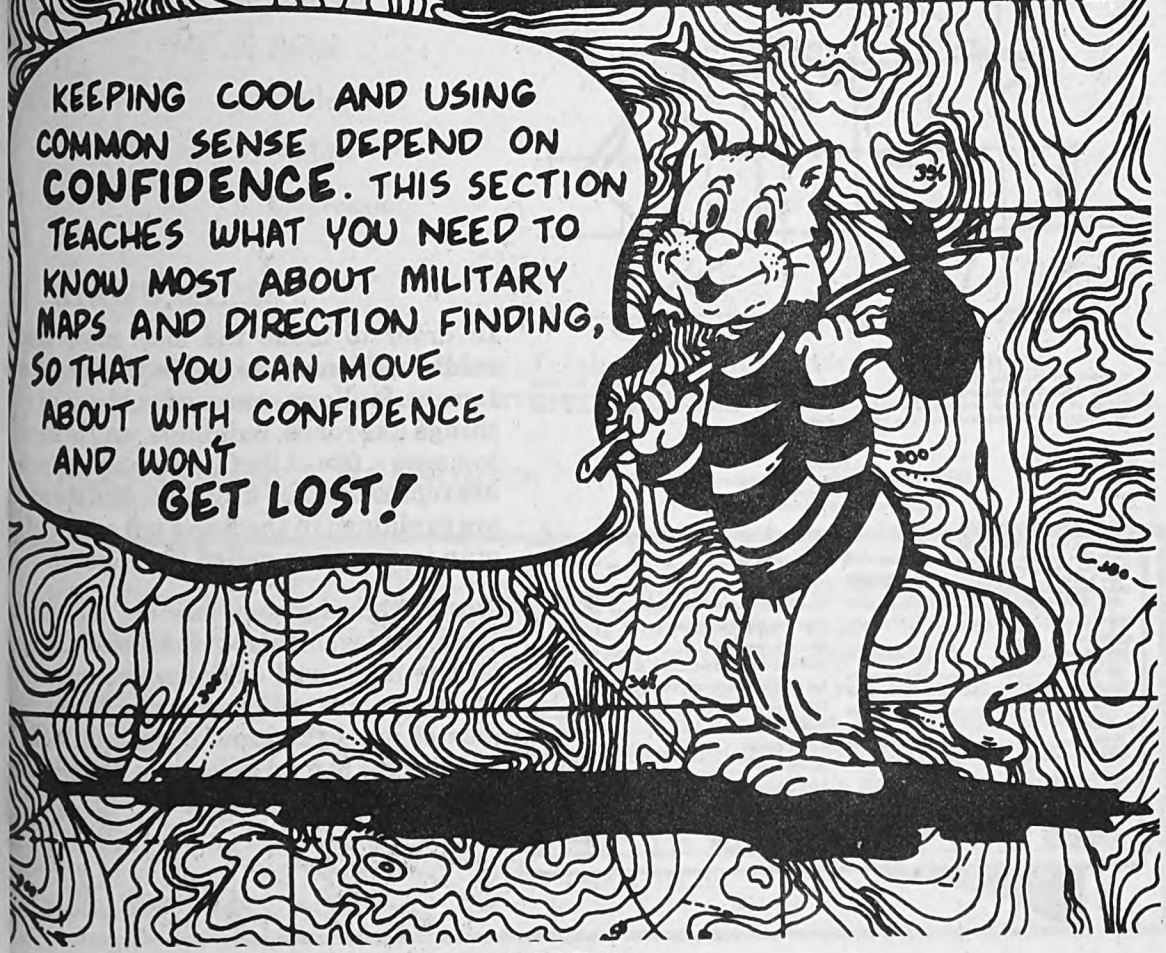
INTRODUCTION TO LAND NAVIGATION

If you get lost in combat, bad things can happen. You may run into some nasty people—the enemy. You may not get where you are supposed to go—fail your mission. You may have trouble getting back to your unit—miss your meals and worry the CO.

What can you do to keep from getting lost? Read a map correctly. Use a compass correctly. Use other ways to find directions. Keep cool. Use common sense.


KEEPING COOL AND USING COMMON SENSE DEPEND ON CONFIDENCE. THIS SECTION TEACHES WHAT YOU NEED TO KNOW MOST ABOUT MILITARY MAPS AND DIRECTION FINDING, SO THAT YOU CAN MOVE ABOUT WITH CONFIDENCE AND WON'T GET LOST!

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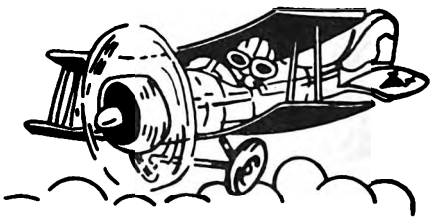
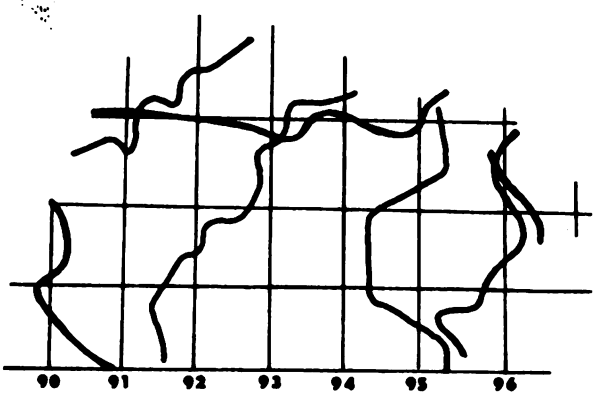
The first thing you should know about a map is that it's nothing more than a drawing of a piece of the earth's surface. It's a drawing made of the earth as you would see it from an airplane

—looking straight down.





Prepared by the Army Map Service (LU), Corps of Engineers, U.S. Army, Washington, D.C. Compiled in 1966 from Alabama, 1:25,000, AMS, Sheets 3847 III NE, NW, SE, SW, field checked 1965. Horizontal and vertical control by USC&GS, AMS and CE. This map complies with the national standard map accuracy requirements. Map not field checked.

LEGEND

Tint indicates areas in which only landmark buildings are shown

ROAD DATA 1965

In developed areas, only through roads are classified

Hard surface, heavy duty road, four or more lanes wide	4 LANES IN 1 LANE	Improved light duty road, street	
Hard surface, heavy duty road: Two lanes wide; Three lanes wide	1½ LANES	Unimproved dirt road	
Hard surface, medium duty road, four or more lanes wide	4 LANES IN 1 LANE	Trail	
Hard surface, medium duty road: Two lanes wide; Three lanes wide	1½ LANES	Route markers: Interstate; Federal; State	65 (US) 90
Buildings		Barns, sheds, greenhouses, stadiums, etc.	
RAILROADS	Single track / Multiple track	Bench mark, monumented	BM ×708
Standard gauge		Bench mark, non-monumented	×431
Narrow gauge		Spot elevations in feet: Checked; Unchecked	766 / 768
In street		Light, lighthouse; Windmill, wind pump; Water mill	
Carline		Woods or brushwood	
BOUNDARIES		Vineyard; Orchard	
National		Intermittent lake	
State (with monument)		Intermittent stream; Dam	
County		Marsh or swamp	
County subdivision		Rapids; Falls	
Corporate limits		Large rapids; Large falls	
Military reservation			
Other reservation			

In order to make the map more useful soldiers, the map shows much more than terrain. It shows manmade objects as well things like roads, buildings, and bridges, to name a few. All of these manmade objects are represented by a symbol, and the symbols are explained in the lower left corner of the map in a section called the **legend.**

Besides giving symbols for manmade objects, the legend also gives the color codes on the map, and explains the meaning of other symbols which give you an even better idea of what the ground actually looks like. Look at the legend before you begin using the map.

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TASK NUMBER: 071-329-1001

IDENTIFY TERRAIN FEATURES (NATURAL AND MANMADE) ON THE MAP

CONDITIONS:

Given a standard 1:50,000 scale military map which includes examples of one or more of each of the natural features identified in 1 through 5 below, and which has examples of the use of colors to identify classes of features as in 6 through 10 below:

1. Hilltop
2. Ridge
3. Valley
4. Saddle
5. Depression
6. Black
7. Blue
8. Green
9. Brown
10. Red

STANDARDS:

Within 3 minutes, identify one of each type terrain feature marked on the map given to you by your supervisor.

PERFORMANCE MEASURES:

Your military map shows something important that ordinary maps don't have. That is elevation (relief)—the slopes, hills, and valleys. You will learn later in this book about locating points, measuring distances, and finding the right direction. But you should also check hills and valleys along the direction you intend to travel before you start. **IT MIGHT SAVE YOU SOME TROUBLE.**

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1. To identify terrain features, refer to figure 1.

2. Colors used to identify a class of features.

a. Black - The majority of cultural or manmade features.

b. Blue - Water features such as lakes, rivers, and swamps.

c. Green - Vegetation such as woods, orchards, and vineyards.

d. Brown - All relief features such as contour lines.

e. Red - Used to classify manmade features as to their type or use, e.g., main roads, built-up areas, and special features.

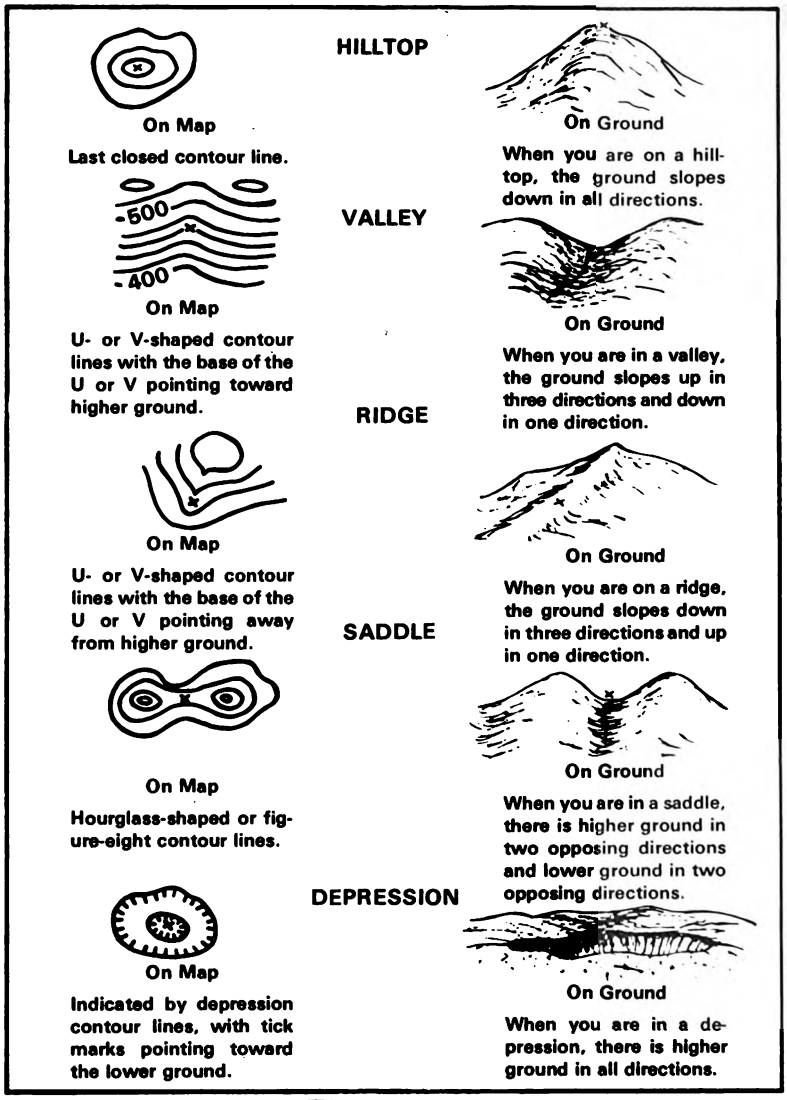
HILLTOP
On Map
Last closed contour line.
On Ground
When you are on a hill-top, the ground slopes down in all directions.
VALLEY
-500
-400
On Map
U- or V-shaped contour lines with the base of the U or V pointing toward higher ground.
On Ground
When you are in a valley, the ground slopes up in three directions and down in one direction.
RIDGE
On Map
U- or V-shaped contour lines with the base of the U or V pointing away from higher ground.
On Ground
When you are on a ridge, the ground slopes down in three directions and up in one direction.
SADDLE
On Map
Hourglass-shaped or figure-eight contour lines.
On Ground
When you are in a saddle, there is higher ground in two opposing directions and lower ground in two opposing directions.
DEPRESSION
On Map
Indicated by depression contour lines, with tick marks pointing toward the lower ground.
On Ground
When you are in a depression, there is higher ground in all directions.

Figure 1.

NOTE: Occasionally, other colors may be used to show special information. These will be indicated in the marginal information on the map.

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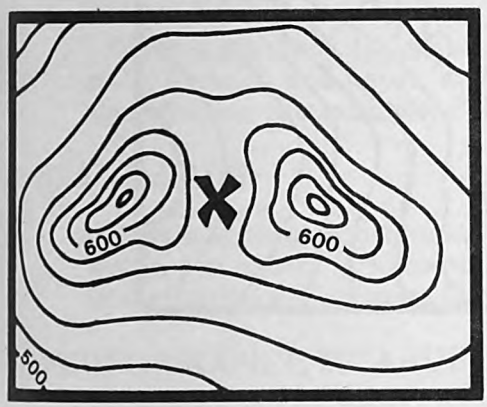
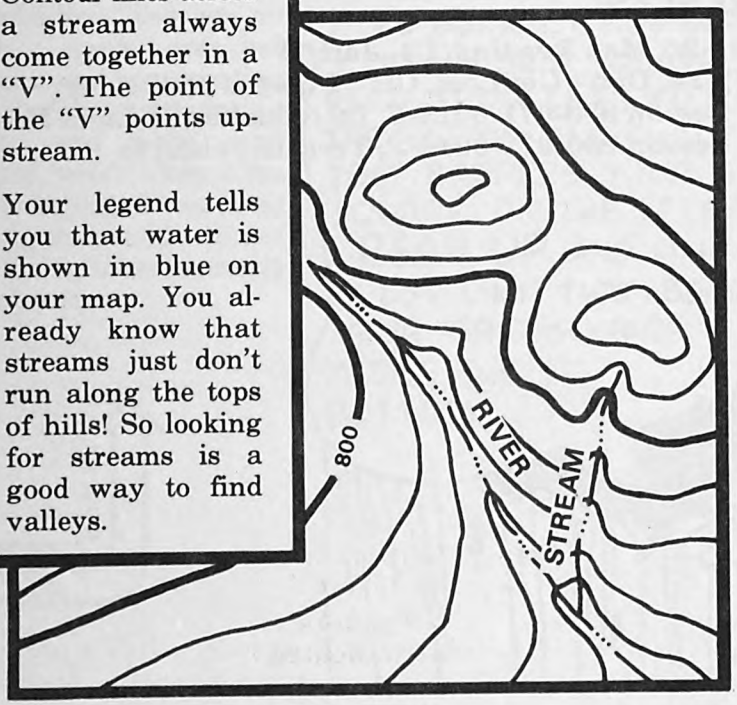
Sometimes contour lines show two hilltops fairly close together. The lower terrain between the two hilltops is called a SADDLE. Going through a saddle is sometimes the easiest route to use to get beyond the two hills. Of course, you wouldn't go through a saddle if the enemy was on the hills.



Contour lines across a stream always come together in a "V". The point of the "V" points upstream.

Your legend tells you that water is shown in blue on your map. You already know that streams just don't run along the tops of hills! So looking for streams is a good way to find valleys.



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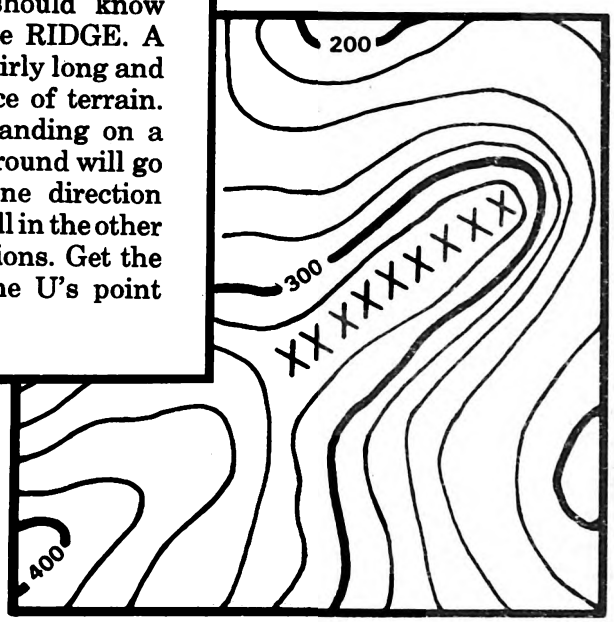
Another terrain feature that you should know about is the RIDGE. A ridge is a fairly long and narrow piece of terrain. If you're standing on a ridge, the ground will go uphill in one direction and downhill in the other three directions. Get the picture? (The U's point downhill.)



REFERENCES:

FM 21-26, Map Reading, C1, Jan 69
TC 21-26, Don't Get Lost, Oct 72 (pages 46 thru 49)
TEC Lesson 930-071-0013-F, Introduction to Land Navigation
TEC Lesson 930-071-0016-F, Terrain Features

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TASK NUMBER: 071-329-1002

DETERMINE THE GRID COORDINATES OF A POINT ON A MILITARY MAP USING THE MILITARY GRID REFERENCE SYSTEM

CONDITIONS:

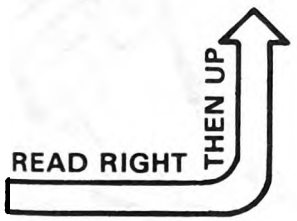
Given a standard, 1:50,000 scale military map, a 1:50,000 grid coordinate scale, a pencil and paper, and a point on the map which is labeled for identification (for example, Point A).

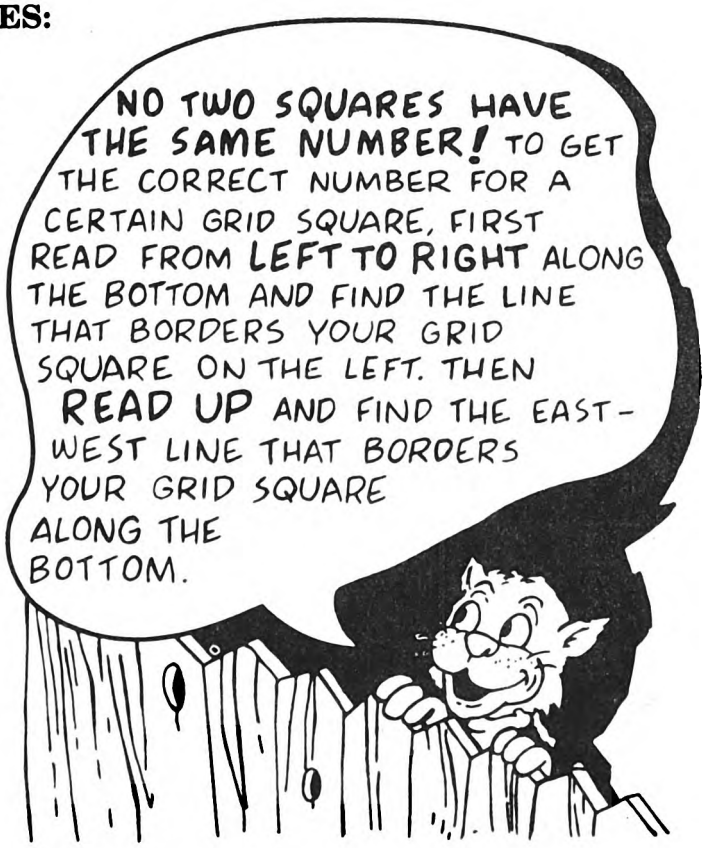
STANDARDS:

Within 2 minutes, determine the six-digit grid coordinates for a point to within 100 meters (grid coordinates must be preceded by the correct two-letter 100,000-meter-square identifier).

PERFORMANCE MEASURES:

To keep from getting lost in the boonies you have to know how to find your location or your address. There are no street addresses in a combat area, but the military map can spot your location accurately. It has black lines running up and down (north and south) and crosswise (east and west). They form small squares called grids. These lines are numbered along the outside edge of the map picture. Using these numbers you can name each square.




NO TWO SQUARES HAVE THE SAME NUMBER! TO GET THE CORRECT NUMBER FOR A CERTAIN GRID SQUARE, FIRST READ FROM LEFT TO RIGHT ALONG THE BOTTOM AND FIND THE LINE THAT BORDERS YOUR GRID SQUARE ON THE LEFT. THEN READ UP AND FIND THE EAST-WEST LINE THAT BORDERS YOUR GRID SQUARE ALONG THE BOTTOM.

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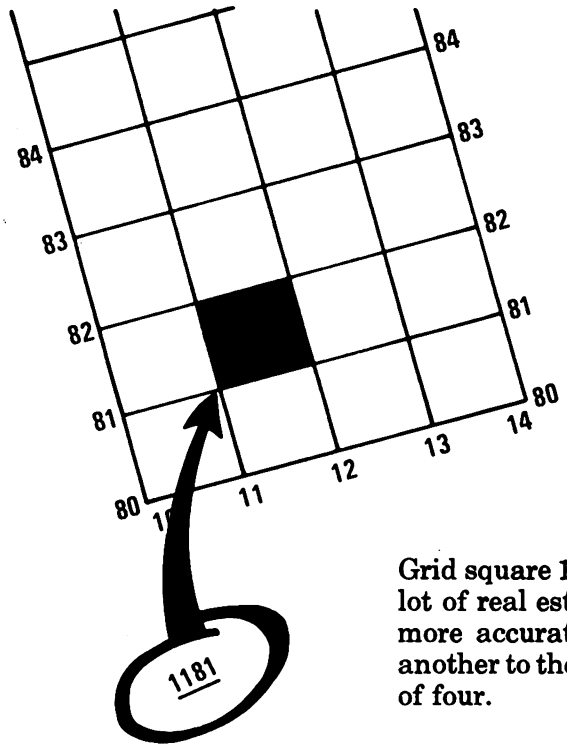
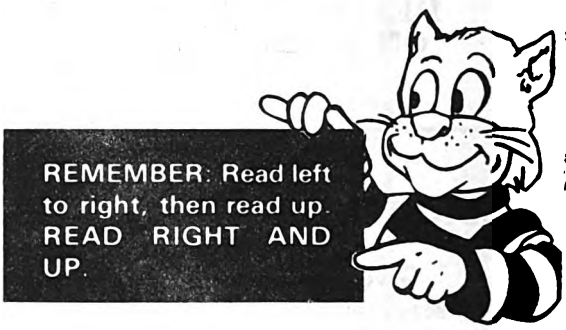


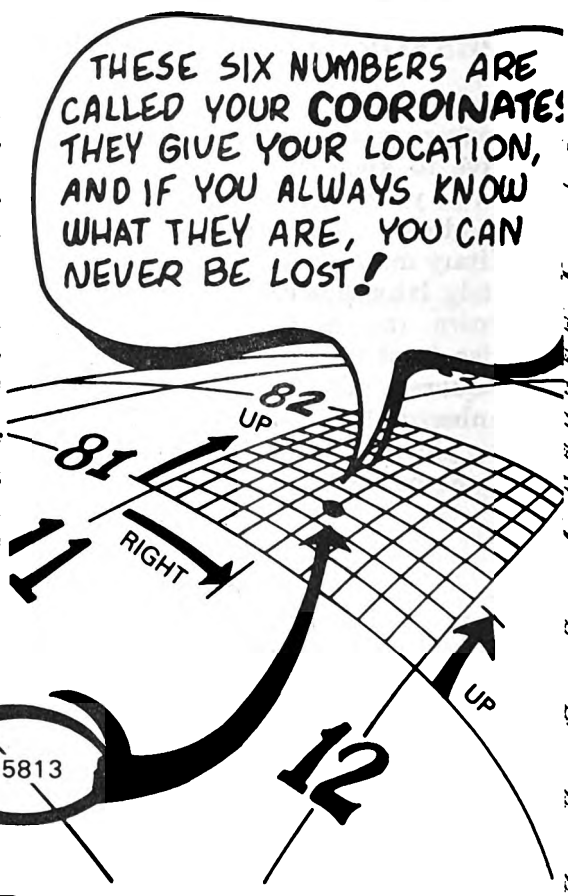
Look at the picture. Your address is grid squ
1181. How do you know this? Start from the
and read RIGHT until you come to 11, the **first**
of your address. Then read UP to 81, the **last h**
Your address is somewhere in grid square 11



Grid square 1181 gives your general neighborhood, but there
lot of real estate inside that grid square. To make your addr
more accurate just add another number to the first half a
another to the last half—so your address has six numbers inst
of four.

Here's how to get those extra numbers. Pretend that each grid square has ten lines inside it running north and south, and another 10 running east and west. This makes 100 smaller squares. You can estimate where these imaginary lines are.

Suppose you are halfway between line 11 and line 12. Then the extra number is 5 and the first half of your address is 115. Now suppose you are also 3/10 of the way between line 81 and line 82. Then the second half of your address is 813. (If you were exactly on line 81 the second part would be 810.) The picture shows that if you were located where the dot is in grid square 1181, then your address would be 115813.



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5. Check to see that the zeros of the coordinate scale are in the lower lefthand (southwest) corner of the grid square.

6. Slide the coordinate scale to the right keeping the bottom of the scale on the bottom grid line until Point A is located under the vertical (righthand) scale. (See figure 2.)

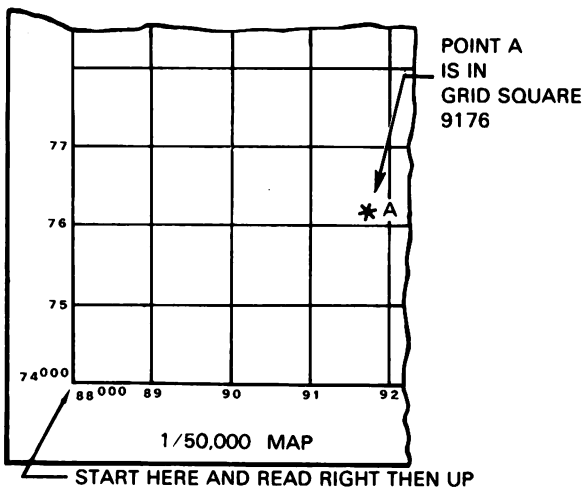

Figure 1.

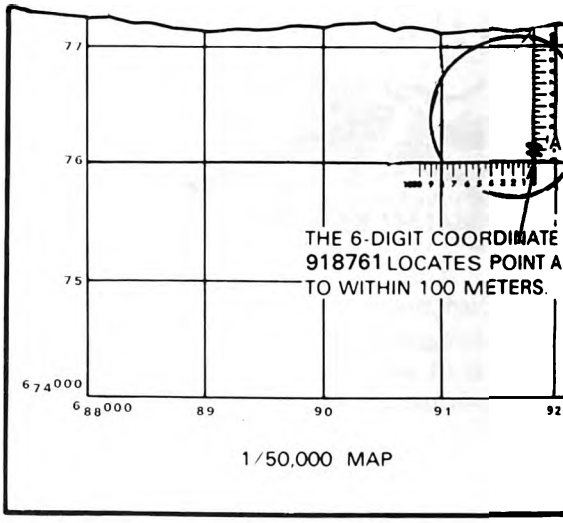

Figure 2.

7. The 100-meter mark on the bottom (horizontal) coordinate scale which is nearest the north-south gridline represented by the first and second digit of the coordinate to be determined is the third digit.

8. The 100-meter mark on the righthand (vertical) coordinate scale which is nearest Point A is the sixth digit.

9. Write the 6-digit coordinate on the paper provided.

10. Determine the correct two-letter 100,000-meter-square identifier by looking at the grid reference box in the margin of the map.

11. Place the 100,000-meter-square identifier in front of the 6-digit coordinate.

NOTE: As an alternate training method to improve map reading ability, start with a six-digit coordinate and plot the point on the map.

REFERENCES:

FM 21-26, Map Reading, C1, Jan 69 (chap 3, pages 3-8 thru 3-20, para 3-4 thru 3-7)
TC 21-26, Don't Get Lost, Oct 72 (pages 5-9)
TEC Lesson 930-071-0013-F, Introduction to Land Navigation

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TASK NUMBER: 071-329-1010

DETERMINE AZIMUTHS USING A COORDINATE SCALE AND PROTRACTOR

CONDITIONS:

Given a standard 1:50,000 scale military map, two known points plotted on the map, coordinate scale and protractor, a straightedge object, a pencil, and a requirement to determine the azimuth from your location (Point A) to another point (B) on the map.

STANDARDS:

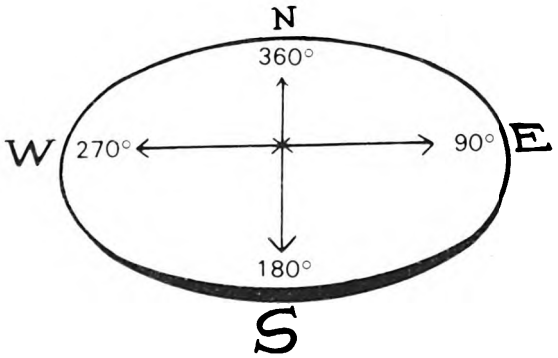
1. Determine the grid azimuth from your location (Point A) to Point B to within 1 degree in 3 minutes.

2. Determine the back azimuth of a given azimuth to the exact degree.

PERFORMANCE MEASURES:

1. The direction from one point to another point, either on the map or on the ground, has a military name --

2. Azimuths are given in degrees in a clockwise direction. Since there are 360 degrees in a circle, your azimuth can be any number up to 360. Due east is 90 degrees, due south is 180 degrees, due west is 270 degrees, and due north is 360 degrees.



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3. To get the right azimuth from a map you have to use a protractor. **Here is how to use your protractor to determine an azimuth:**

a. Determine your location (Point A) and the location of the other point (B) on the map (see figure 1).

b. Draw a straight line from Point A to Point B.

c. Place the index of the protractor over center of mass of Point A with the 0° on the protractor at the top and 90° to the right.

d. Start at the 0° point on the protractor and read to the right in a clockwise manner until reaching the point where the straight line intersects the protractor scale.

e. Read the azimuth in degrees from the protractor - 210°.

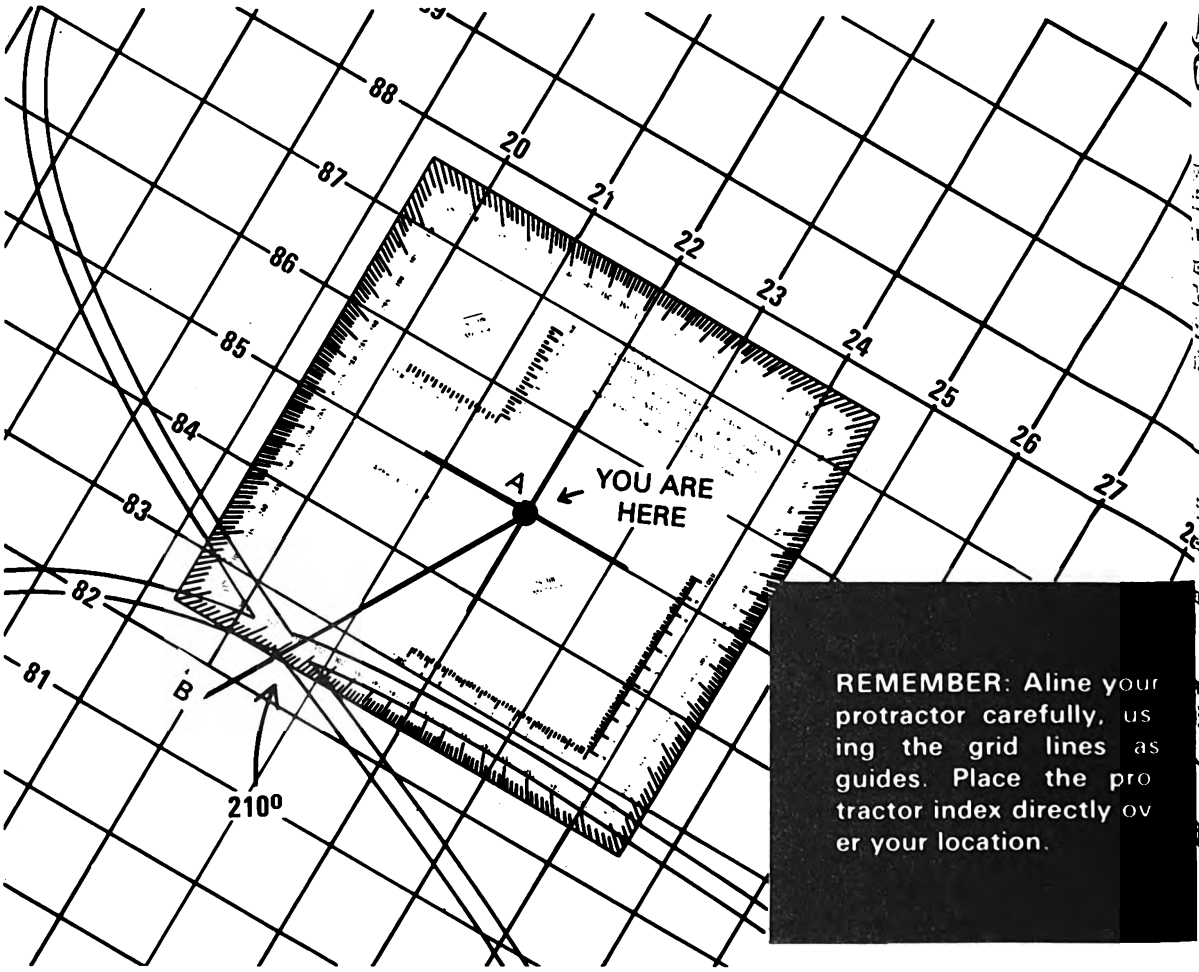

Figure 1.

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320 − 180 = 140

60 + 180 = 240

If you can't subtract 180 degrees because your first azimuth is too small, then just add 180 degrees. For example, if your azimuth was 40 degrees, you know that you can't subtract 180 degrees, so you add 180. The back azimuth would be 40 + 180 = 220 degrees.

210 − 180 = 30

16 + 180 = 196

40 + 180 = 220

190 − 180 = 10

72 + 180 = 252

Suppose you follow the 210-degree azimuth in figure 1 to the road junction, and then want to go back to your original location. To do this, you take a BACK AZIMUTH. You simply subtract 180 from the first azimuth. Your back azimuth is 210 - 180 = 30 degrees.

REMEMBER: A back azimuth goes in the opposite direction from an azimuth.

Can you figure out the back azimuth of 290 degrees?

How about the back azimuth of 75 degrees?

Check your answers with the correct answers listed to the right.

ANSWERS: The back azimuth of 290 degrees is 290 minus 180, which is 110 degrees. The back azimuth of 75 degrees is 75 plus 180, which is 255 degrees.

REFERENCES:

FM 21-26, Map Reading, C1, Jan 69
TC 21-26, Don't Get Lost, Oct 72
TEC Lesson 930-071-0014-F, Measuring Distance and Azimuth

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TASK NUMBER: 071-329-1009

CONVERT AZIMUTHS (MAGNETIC OR GRID)

CONDITIONS:

Given a standard 1:50,000 scale military map with a declination diagram, a pencil, and either a magnetic azimuth or a grid azimuth which must be converted.

STANDARDS:

Within 3 minutes, convert the given magnetic azimuth to a grid azimuth (or grid to magentic) without error.

PERFORMANCE MEASURES:

1. Easterly Grid-Magnetic (G-M) Angle (figure 1):

a. To convert a magnetic azimuth to a grid azimuth, add the value of the G-M angle to the magnetic azimuth.

b. To convert a grid azimuth to a magnetic azimuth, subtract the G-M angle from the grid azimuth.

2. Westerly Grid-Magnetic (G-M) Angle (figure 2):

a. To convert a magnetic azimuth to a grid azimuth, subtract the value of the G-M angle from the magnetic azimuth.

b. To convert a grid azimuth to a magnetic azimuth, add the value of the G-M angle to the grid azimuth.

Figure 1.

Figure 2.

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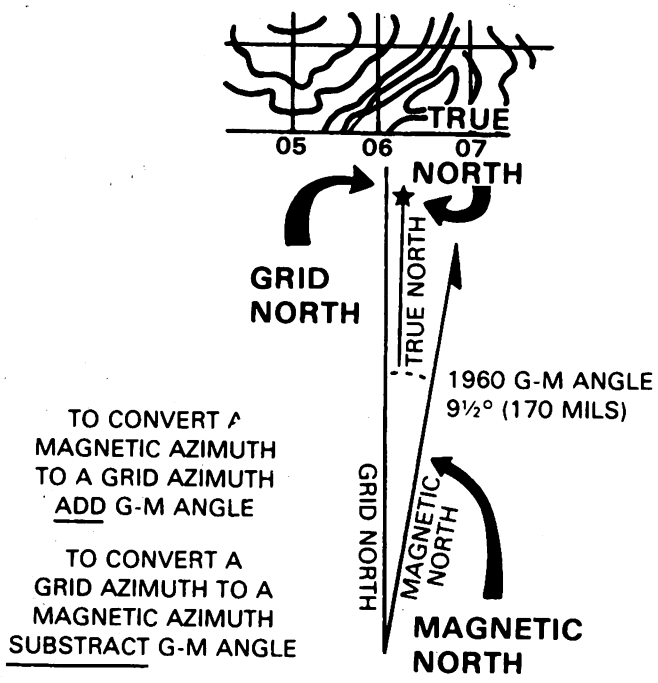
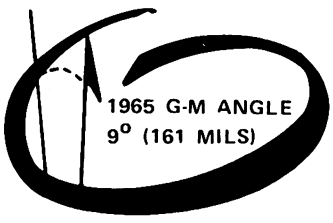
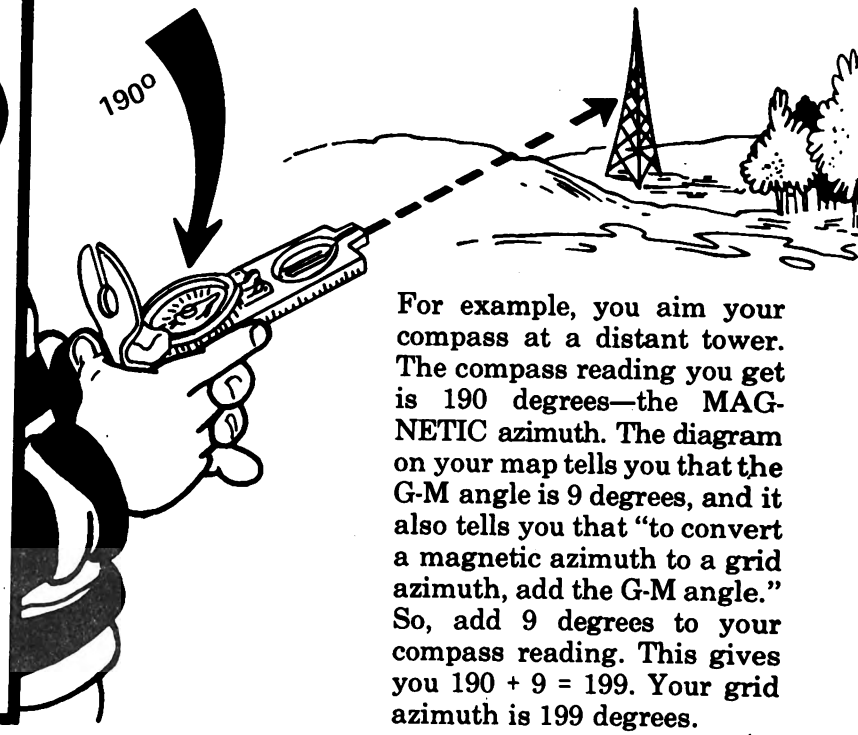


The north-south lines on your map give GRID north. The needle of the compass points to MAGNETIC north. Grid north and magnetic north are usually different by a few degrees. Neither one points straight at the north pole that's called TRUE north, but you needn't worry about TRUE north to keep from getting lost in a combat area. The difference in degrees for every map is shown at the bottom of the map sheet.



The difference between GRID north and MAGNETIC north is called the G-M angle. The diagram at the bottom of the map tells you how to change grid azimuths to magnetic azimuths and magnetic azimuths to grid azimuths.



For example, you aim your compass at a distant tower. The compass reading you get is 190 degrees—the MAGNETIC azimuth. The diagram on your map tells you that the G-M angle is 9 degrees, and it also tells you that "to convert a magnetic azimuth to a grid azimuth, add the G-M angle." So, add 9 degrees to your compass reading. This gives you 190 + 9 = 199. Your grid azimuth is 199 degrees.

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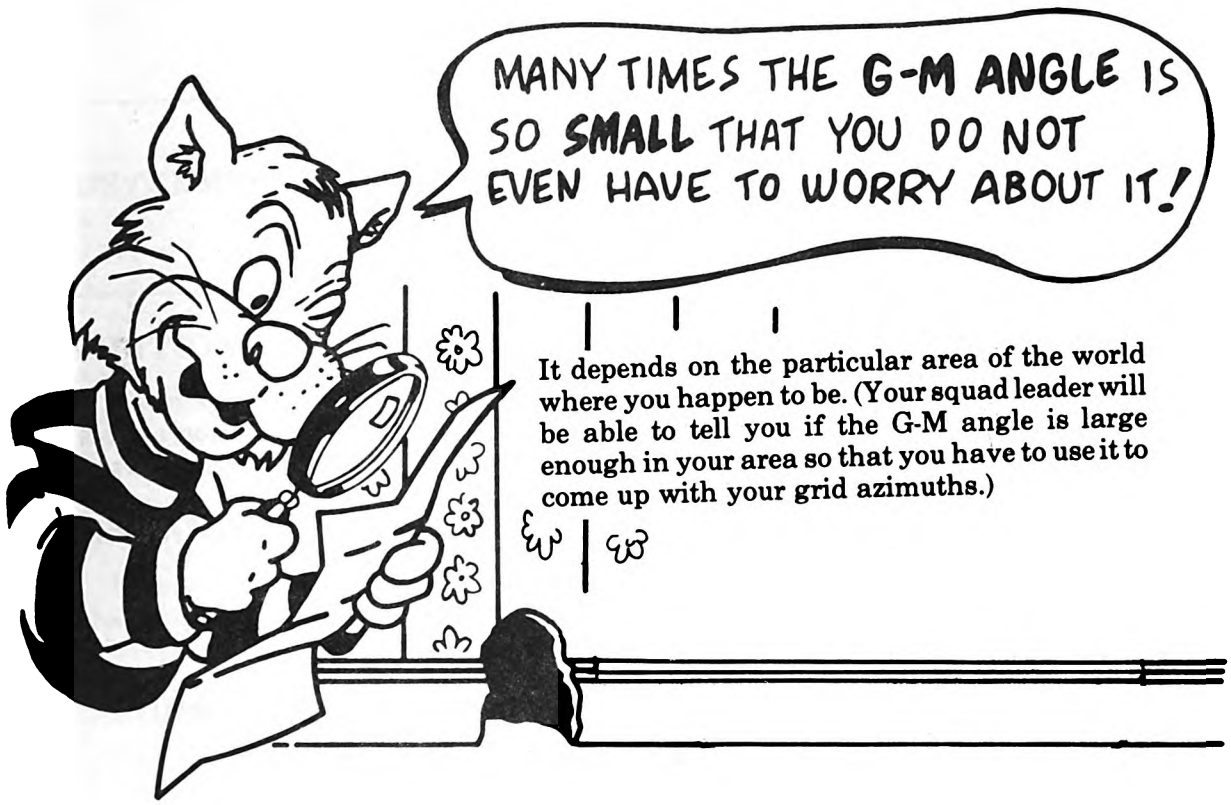

It depends on the particular area of the world where you happen to be. (Your squad leader will be able to tell you if the G-M angle is large enough in your area so that you have to use it to come up with your grid azimuths.)

REFERENCES:

FM 21-26, Map Reading, C1, 20 Jan 69 (Chap 5, para 5-3 thru 5-4; pages 5-1 thru 5-6)
TC 21-26, Don't Get Lost, Oct 72 (pages 21-26)

TEC Lesson: 930-071-0015-F, Converting Azimuths

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TASK NUMBER: 071-329-1003

DETERMINE A MAGNETIC AZIMUTH USING A COMPASS

CONDITIONS:

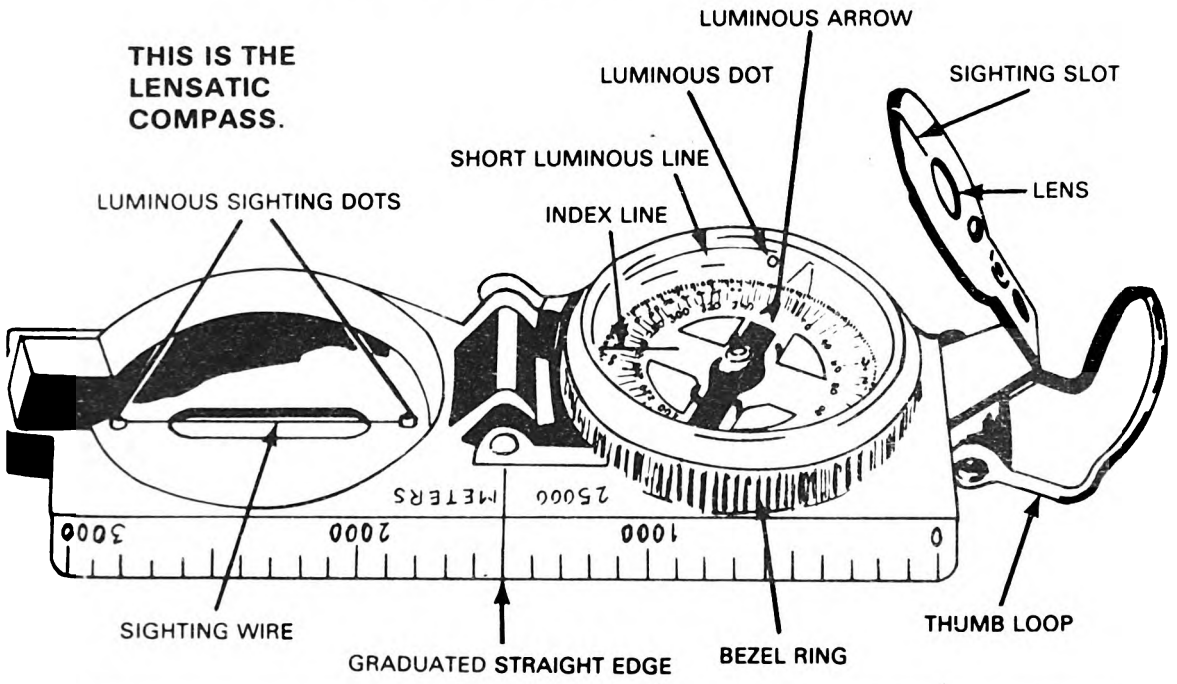
Given a compass (which has been checked against an aiming circle and has no noticeable deviation), a designated point on the ground, in a field environment, under daylight conditions.

STANDARDS:

Within 1 minute, determine the correct magnetic azimuth to the designated known point, to within 3 degrees, using the center-hold technique.

PERFORMANCE MEASURES:

KNOW YOUR COMPASS



BEWARE: Your compass is a sensitive instrument, and it's your best friend in the boonies. Take care of it and it will take care of you!

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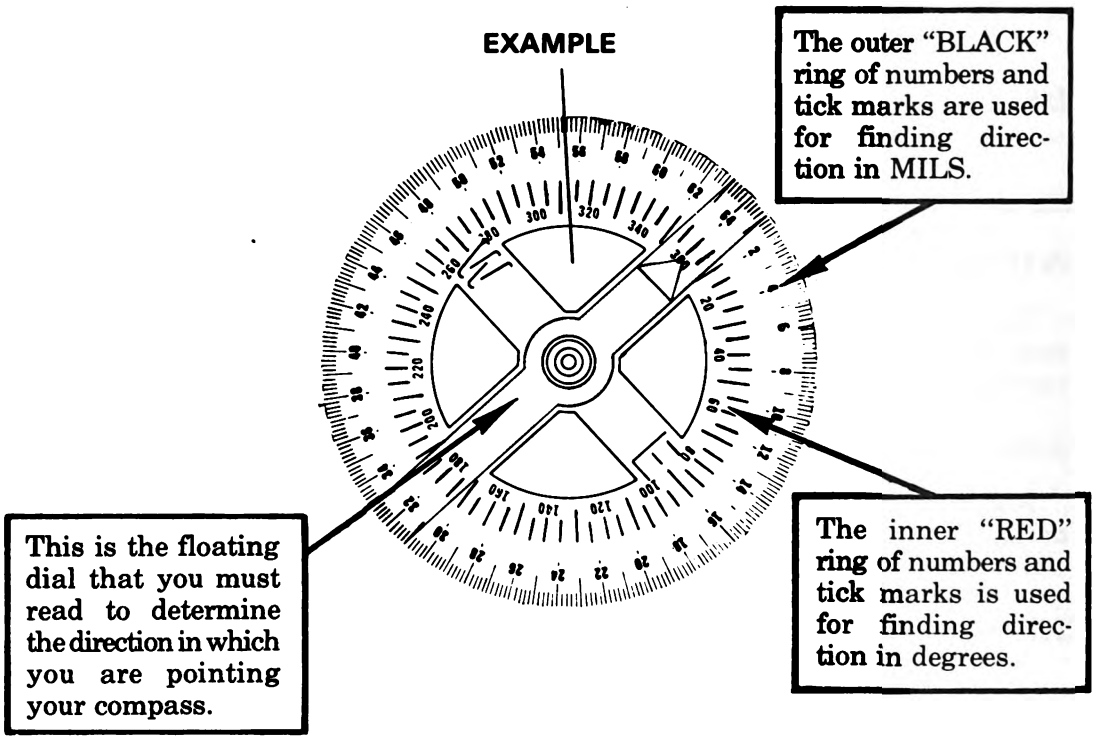
HOW TO READ YOUR COMPASS


EXAMPLE
The outer "BLACK" ring of numbers and tick marks are used for finding direction in MILS.
The inner "RED" ring of numbers and tick marks is used for finding direction in degrees.
This is the floating dial that you must read to determine the direction in which you are pointing your compass.

(1) There are 360 degrees or 6400 mils (‰) in a complete circle and these are marked for you with a tick mark every 5 or 20 ‰. However, you will notice that not every tick mark is numbered. So you will have to determine the number for these lines using the numbers that are shown.

(2) To read direction, point the compass in the direction you want to go or the direction you want to determine.

(3) Look beneath the black hairline on the outer glass cover and estimate to the nearest degree or 10 mils the position of the hairline over the (red/black) scale.

(4) Be careful to hold the compass still so that the dial remains stationary while you are reading the scale.

(5) In the example above, the readings are:

a. Degrees (Red Scale) - 312°

b. Mils (Black Scale) - 5530 mils

(6) If you understand the readings in the example and can apply the center-hold technique of shooting an azimuth, you'll be proficient in performing this task.

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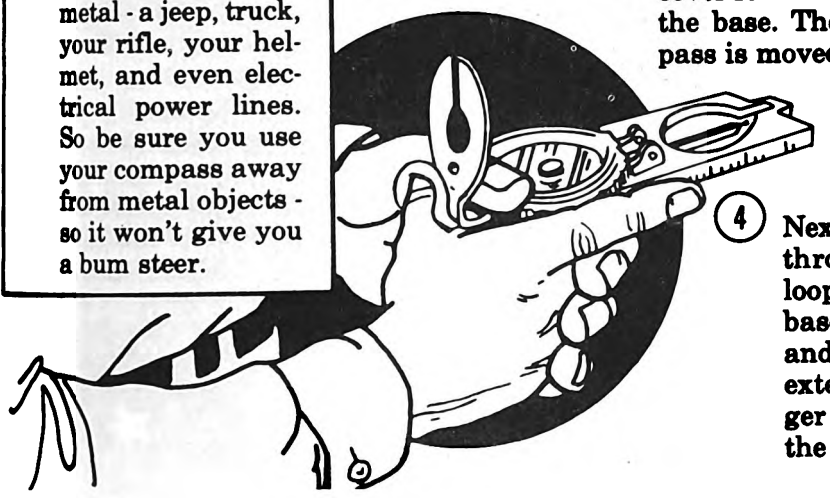
How Do You SHOOT An Azimuth?

(1) You use your compass to find or follow an azimuth. The arrow on the compass points towards magnetic north. The arrow is also attracted by any mass of metal - a jeep, truck, your rifle, your helmet, and even electrical power lines. So be sure you use your compass away from metal objects - so it won't give you a bum steer.

(2) You should use the center-hold technique! It's faster, easier, and more accurate than the old sighting method.

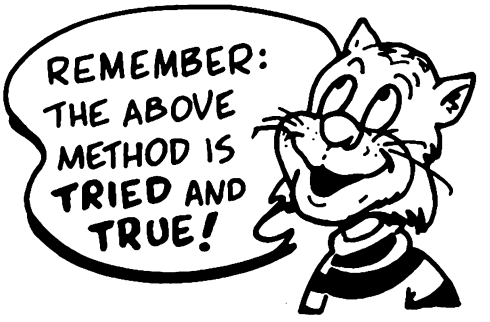
(3) Open the compass so that the cover forms a straight edge with the base. The lens of the compass is moved out of the way.



(4) Next, place your thumb through the thumb loop, form a steady base with your third and fourth fingers and extend your index finger along the side of the compass.

(5) Place the thumb of the other hand between the eyepiece and the lens; extend the index finger along the remaining side of the compass and the remaining fingers around the fingers of the other hand; pull your elbows firmly into your sides. This will place the compass between your chin and your belt.

(6) To measure an azimuth, simply turn your entire body toward the object, pointing the compass cover directly at the object. Once you are pointing at the object, just look down and read the azimuth from beneath the fixed black index line. Man, you can even use this method at night!



(7) If you are land navigating, stop occasionally to check the azimuth along which you are moving to keep from going in circles. Also, you can move from object to object along your path of travel by shooting an azimuth to each object and then moving to that object. Repeating this process while you navigate should keep you "straight!"

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TASK NUMBER: 071-329-1018

DETERMINE DIRECTION USING FIELD EXPEDIENT METHODS

CONDITIONS:

Given: you are temporarily disoriented or have become detached from your unit and you are without a compass. Materials to assist you in performing this task will depend upon your geographic location. Use the field expedient method that is best suited to your location.

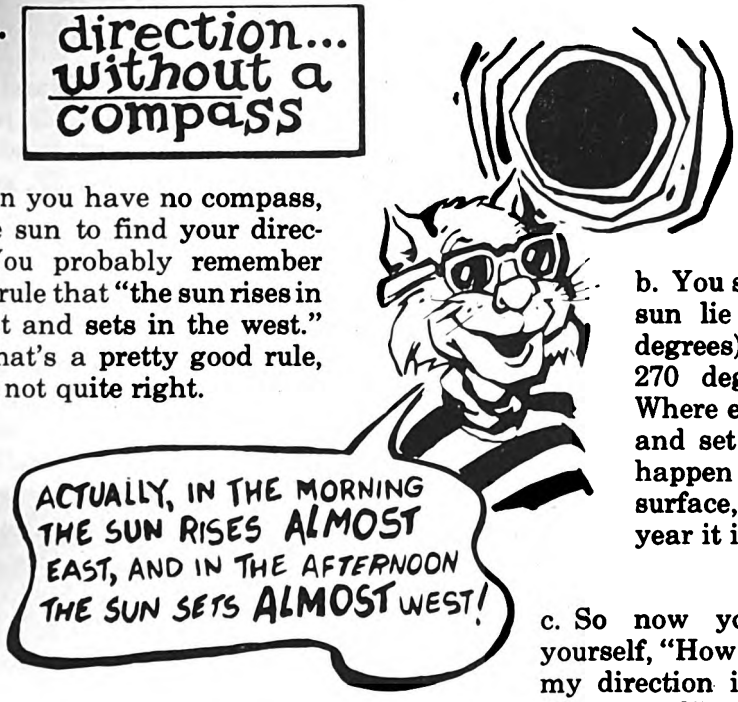
STANDARDS:

Perform any or all of the field expedient methods for determining directions without a compass by following the instructions given in the performance measures below.

PERFORMANCE MEASURES:

1. direction... without a compass

a. When you have no compass, use the sun to find your direction. You probably remember the old rule that "the sun rises in the east and sets in the west." Well, that's a pretty good rule, but it's not quite right.



b. You see, very seldom does the sun lie DUE east (exactly 90 degrees), or DUE west (exactly 270 degrees) on the horizon. Where exactly the sun does rise and set depends on where you happen to be on the earth's surface, and also on what time of year it is.

c. So now you're probably asking yourself, "How can I use the sun to find my direction if I don't know exactly where it is?"

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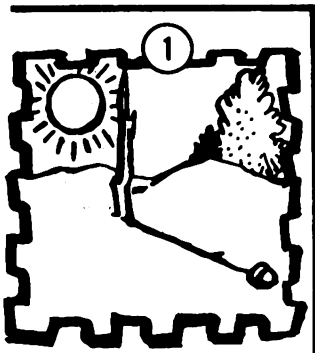
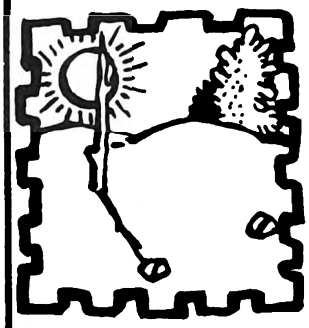
EASY! Just use the SHADOW-TIP field expedient method. It's quick, it's easy, and it's very accurate. Here's how to do it in three simple steps:

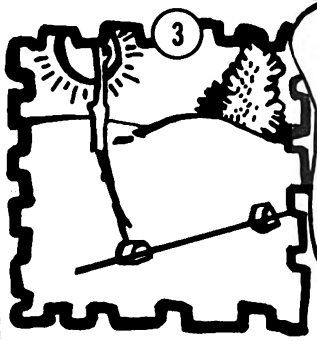


Place a stick or branch into the ground vertically at a fairly level spot where a distinct shadow will be cast. Mark the shadow tip with a stone, twig, or other means.

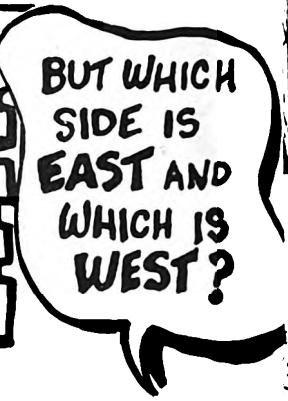
2

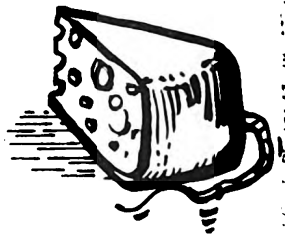
Wait about 10 or 15 minutes until the shadow tip moves a few inches. Mark the new position of the shadow tip just like the first.

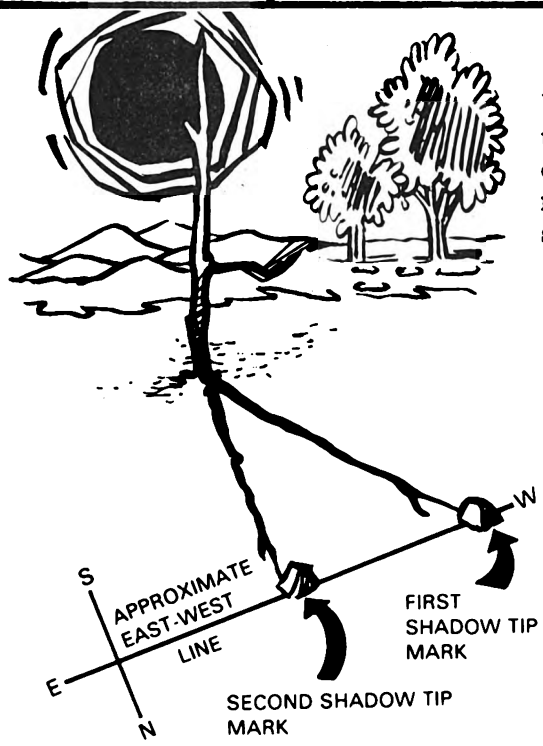




Draw a straight line through the two marks which you made on the shadow tips. This line you have drawn is an EAST-WEST line.







Well, since the sun rises in the east and sets in the west, the shadow tip moves in just the opposite direction. So the first shadow tip mark you make is always WEST, and the second mark is always EAST.

REMEMBER: Place your stick vertically into the ground. Mark the tip of each shadow. The first tip is the WESTERN half of your line, and the second tip is the EASTERN half. You can draw a NORTH-SOUTH line perpendicular to your EAST-WEST line.

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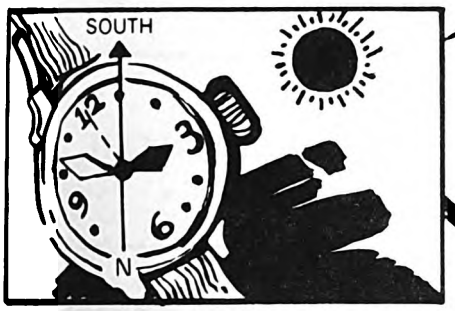
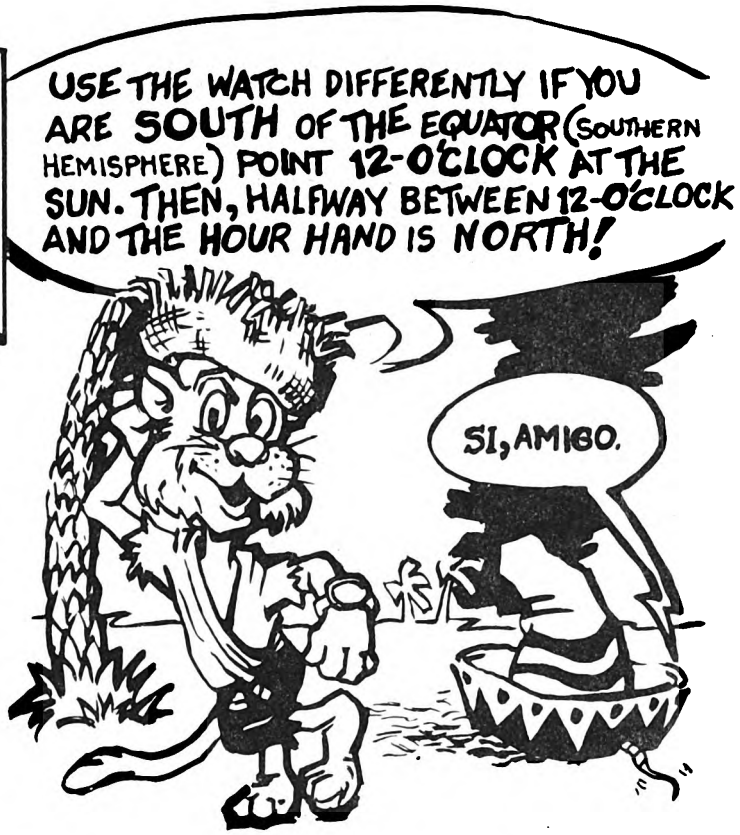
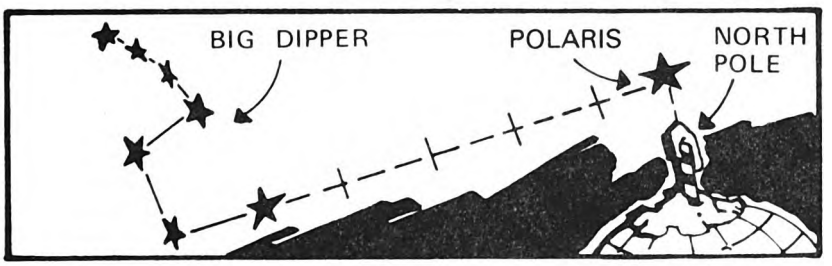



USE THE WATCH DIFFERENTLY IF YOU ARE SOUTH OF THE EQUATOR (SOUTHERN HEMISPHERE) POINT 12-O'CLOCK AT THE SUN. THEN, HALFWAY BETWEEN 12-O'CLOCK AND THE HOUR HAND IS NORTH!
SI, AMIGO.

ou can also find direction with your vatch. It's not as accurate as the SHADOW-TIP method, but it will do n a pinch. North of the equator northern hemisphere), this is how it works. Point the hour hand at the un. Then, SOUTH will be half way etween the hour hand and twelve 'clock. Try this in a place where you lready know the directions to prove hat it works.



t night, you can locate north by finding the north star (POLARIS). First, nd the Big Dipper. The last two stars in the cup point directly at Polaris, hich is about 5 times as far out as the distance between those 2 stars in the ip. Facing Polaris you are looking north, with east on your right and west n your left.

REFERENCES:

TC 21-26, Don't Get Lost, Oct 72

TEC Lesson 930-071-0162-F, Determine Direction Using a Field Expedient Method

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TASK NUMBER: 071-329-1016

DETERMINE AN AZIMUTH USING AN M2 COMPASS

CONDITIONS:

Given:

1. M2 compass (declinated to read grid azimuths).
2. Exact location from which to measure azimuth.
3. Three targets (objects) to which azimuths must be determined.

STANDARDS:

Within 3 minutes, determine the azimuth to each of 3 targets (objects) to within 10 mils.

PERFORMANCE MEASURES:

To determine azimuth using a compass:

1. Place the cover at an angle of approximately 45° to the face of compass so that the scale reflection can be viewed in the mirror.

2. Adjust sights to the desired position using one of these methods.

a. Raise rear sight holder approximately perpendicular to face of compass. Sight on object through rear sight holder and through window in cover. The compass is correctly sighted when it is level (bubble in circular level is approximately centered and needle floats freely) and the black centerline of the window bisects the object and the opening in the rear sight.

b. Fold rear sight holder out parallel with the face of the compass, with rear sight perpendicular to its holder. Sight through window in the cover. The compass is correctly sighted when it is level and black centerline of the window, the rear sight, and the object are alined.

NOTE: If object sighted is at a lower elevation than the compass, raise rear sight holder as needed.

c. Raise front sight and rear sight perpendicular to the face of the compass (figure 1), and sight over the tips of the rear and front sights. Compass is correctly sighted when it is level and tips of the sights and object are alined.

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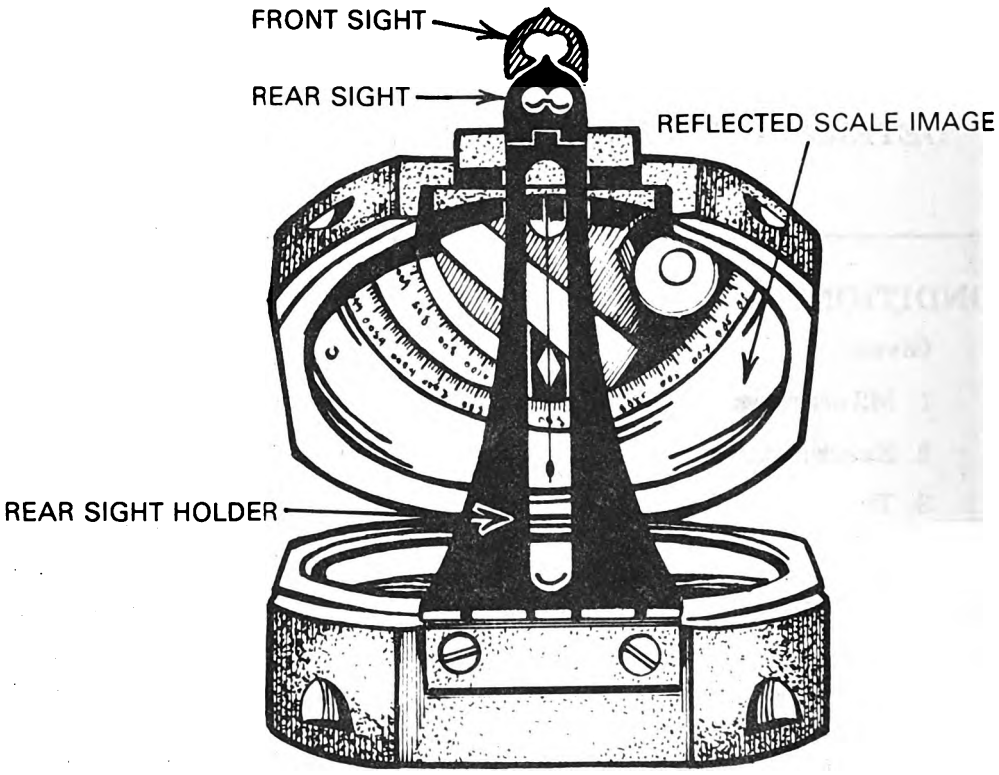

Figure 1.

3. Hold compass in both hands, at eye level, with arms braced against body and rear sight near the eyes.

NOTE: For precise measurements, place compass on a nonmetallic stake or object.

4. Level compass by viewing the circular level in the mirror. Sight on object, look in mirror, and read azimuth indicated by the black end of needle.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Jan 71 (chap 1, page 31, para 36)

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TASK NUMBER: 071-329-1006

NAVIGATE FROM ONE POSITION ON THE GROUND TO ANOTHER POINT

CONDITIONS:

Given a standard 1:50,000 scale military map, compass, a coordinate scale and protractor, and designated start and finish points no more than 3,000 meters apart. The field location of the task should appear on the military map and contain varying types of terrain. Weather conditions should not be considered a limiting factor.

STANDARDS:

Within 1 hour, move from the start point to the finish point.

PERFORMANCE MEASURES:

1. Locate the start point and finish point on the map and determine where the start point is on the ground.
2. Determine the grid azimuth from the start point to the finish point on the map.
3. Convert the grid azimuth to a magnetic azimuth.
4. Determine the distance between the start point and the finish point on the map.
5. Convert the map distance to pace count.
6. Place the azimuth between the start point and the finish point under the fixed black index line of the compass.
7. When planning the route between points, select terrain features that will be encountered by making a map reconnaissance.
8. Make mental checklist of such features.
9. Move to the start point to begin pace count.
10. While moving along the route, check against your list.
11. After reaching the finish point, conduct a detailed terrain analysis to confirm your location.

REFERENCES:

FM 21-26, Map Reading, C1, Jan 69
TC 21-26, Don't Get Lost, Oct 72 (pages 42-46)
TEC Lesson 930-071-0018-F, Land Navigating with Map and Compass
TEC Lesson 930-071-0165-F, Navigate From One Position on the Ground to Another Point

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8. Make mental checklist of such features.

9. Move to the start point to begin pace count.

10. While moving along the route, check against your "list."

11. After reaching the finish point, conduct a detailed terrain analysis to confirm your location.

REFERENCES:

FM 21-26, Map Reading, C1 20 Jan 69
TC 21-26, Don't Get Lost, Oct 72 (pages 42-46)
TEC Lesson 930-071-0018F, Land Navigating with Map and Compass
TEC Lesson 930-071-0165-F, Navigate From One Position on the Ground to Another Point

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TASK NUMBER: 071-329-1007

DETERMINE DISTANCE WHILE MOVING BETWEEN 2 POINTS ON THE GROUND.

CONDITIONS:

Given a 600-meter pace course, a pace factor conversion table to determine your pace count, and a requirement to move by foot over varying types of terrain during daylight hours in all types of weather from a start point to a finish point not less than 500 meters nor greater than 700 meters in length.

STANDARDS:

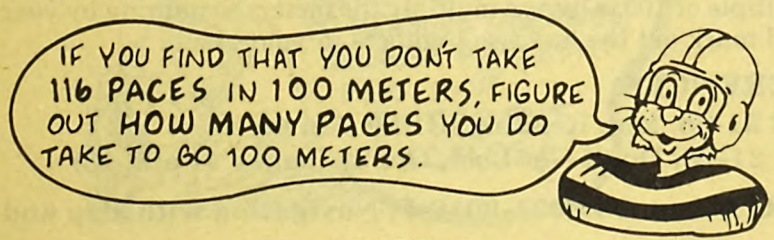
Determine the distance between the start point and finish point to within 5% of the actual distance in a maximum of 45 minutes.

PERFORMANCE MEASURES:

When you have to go a certain distance on foot without any landmarks to guide you, you can measure distance pretty accurately by counting your paces. The average pace is just a little less than one meter. The average man uses 116 paces to travel 100 meters. You should check your pace length by practicing on a known 100-meter distance -- like a football field plus one end zone, which is 110 yards (pretty close to 100 meters).

BEWARE: When you travel cross country like you do in the field, you use more paces to travel 100 meters -- usually about 148 instead of 116. This is because you are not travelling over level ground, and you must use more paces to make up for your movement up and down hills. You should pace yourself over at least 600 meters of cross-country terrain in order to learn how many paces it takes you to travel an average 100 meters over cross-country terrain.

Be sure you know how many paces it take you to walk 100 meters both on level terrain and cross country.



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The big problem in pacing is maintaining a straight line. At night the average man tends to walk in a circle if he doesn't use a compass. In daylight, you should use aiming points and a compass. Also, remember to figure only the straight-line distance when you have to walk around an obstacle.

Another problem is keeping count of paces taken. One way is to use pebbles. For instance, suppose you want to pace off one kilometer. (One kilometer is 1000 meters, or the distance between two of the black grid lines on your map.) Put 10 pebbles in your right pocket. When you go 100 meters move one pebble to your left pocket and start your count over. When all 10 pebbles have been moved to the left pocket, you have travelled one kilometer! Or, you can tie knots in a string -- one knot per 100 meters.

Now let's work a sample problem:

Problem: You are to move 715 meters.

a. Your pace count for 100 meters is equal to 116 paces.

b. Using the pebble method, you will need 7 pebbles. This will take you 700 meters. But what about the other 15 meters?

c. To determine how many paces it will take to go the remaining 15 meters, multiply 15 meters by your pace count (116).

(1) 15 x 116 = 1740

(2) Mark out the last two numbers (40). The remainder is how many paces it will take to go 15 meters (17).

d. So you would go 715 meters using the pebble method by pacing off 116 paces per 100 meters until all 7 pebbles were used, then go an additional 17 paces to arrive at 715 meters.

REMEMBER: When determining your number of paces to go, if it is not a multiple of 100, **always** multiply the meters remaining by your pace count and mark out the last two numbers in your result.

REFERENCES:

FM 21-26, Map Reading, C1 20 Jan 69
TC 21-26, Don't Get Lost, Oct 72 (pages 14 and 15)

TEC Lesson 930-071-0018-F, Navigating with Map and Compass

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TASK NUMBER: 071-329-1008

MEASURE DISTANCE ON A MAP.

CONDITIONS:

Given:

1. A standard 1:50,000 topographic map on which is plotted:

   a. Point A and point B, 3,000 to 4,000 meters apart.

   b. Point C and point D, 3,000 to 4,000 meters apart, on a road (trail) which changes direction at least twice.

2. A strip of paper with a straight edge.

STANDARDS:

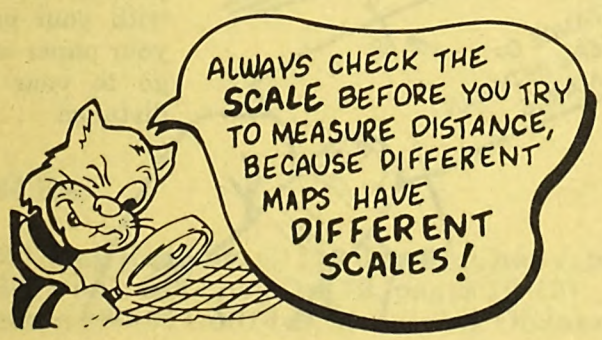
1. Determine the straight-line distance, in meters, from point A to point B within 50 meters, in 3 minutes.

2. Determine the road (curved-line) distance from point C to point D within 100 meters, in 3 minutes.

PERFORMANCE MEASURES:

1. You can use your map to measure distance -- how far it is between two places. The map is drawn to scale. This means that a certain distance on the map equals a certain distance on the earth. The scale is printed at the bottom and at the top of the map, like this -- Scale 1:50,000.

2. This means that 1 inch on the map equals 50,000 inches on the ground. In fact, any ground distance equals 50,000 times that distance on the map.



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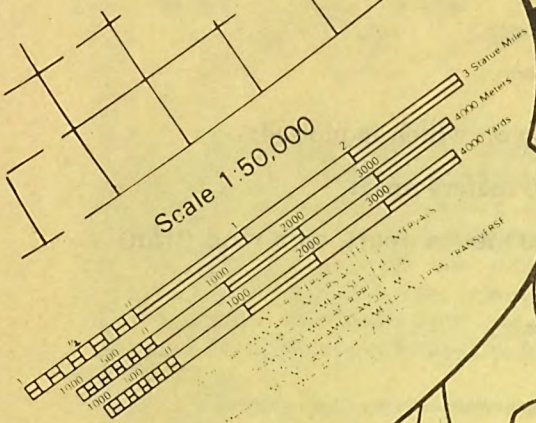
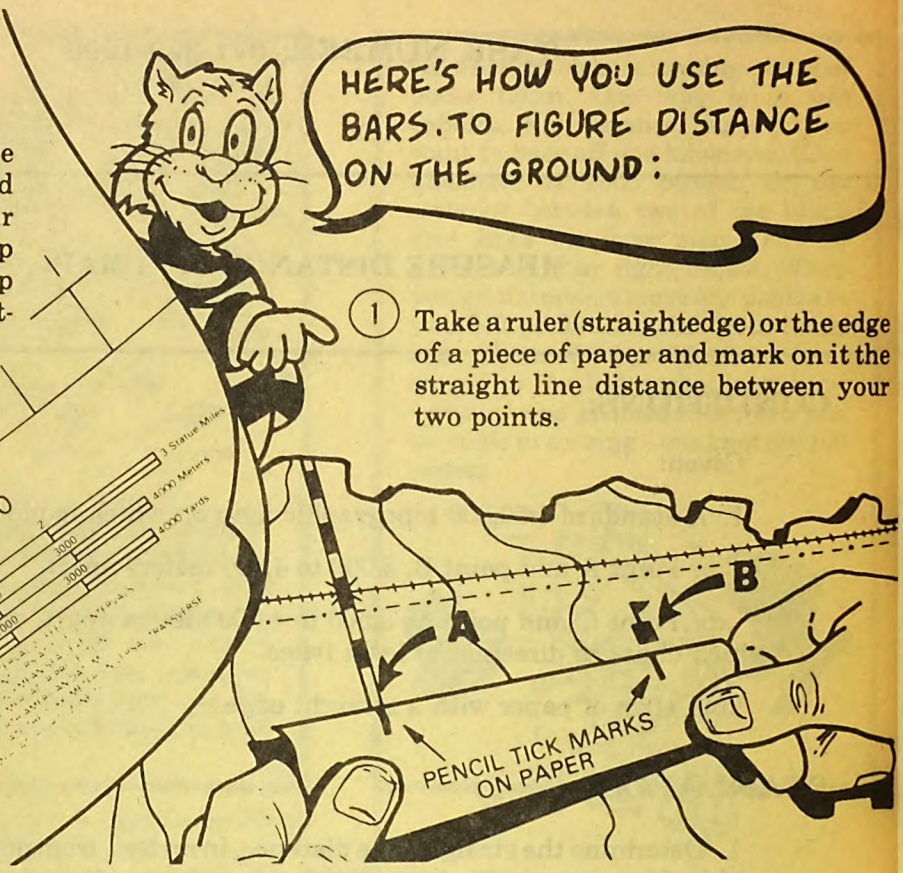
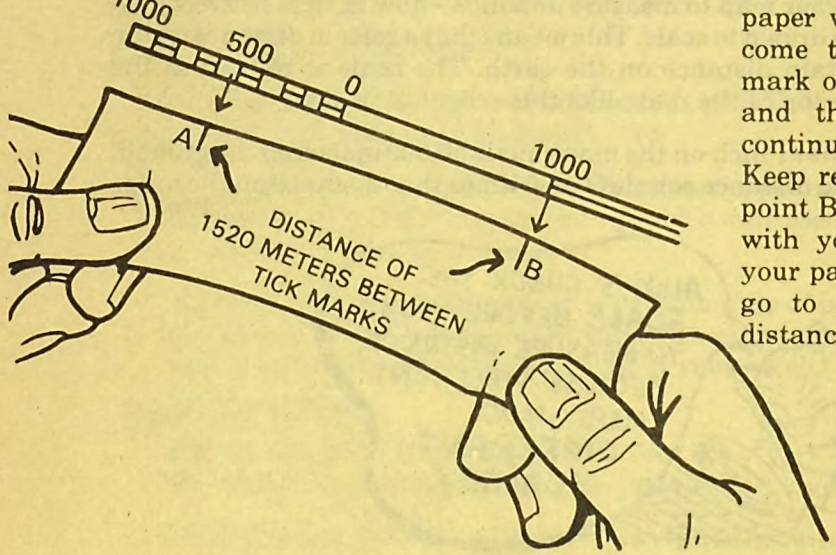
At the bottom of the map you will also find three different bar scales which will help you to change map distance to miles, meters, or yards.





1. Take a ruler (straightedge) or the edge of a piece of paper and mark on it the straight line distance between your two points.

2. Then put the ruler or paper just under one of the bar scales and read the ground distance in miles, meters, or yards. The bar scale in the picture shows a ground distance of 1520 meters.



3. Suppose you want to find the distance between A and B around a curve in a road. Take a strip of paper, make a small tick mark on it, and line up the tick mark with point A. Aline the paper with the road edge until you come to the curve, make another mark on the paper and on the map, and then pivot the paper so it continues to follow the road edge. Keep repeating this until you get to point B. Always follow the road edge with your paper. Make a mark on your paper where it hits B, and then go to your bar scales to get the distance.

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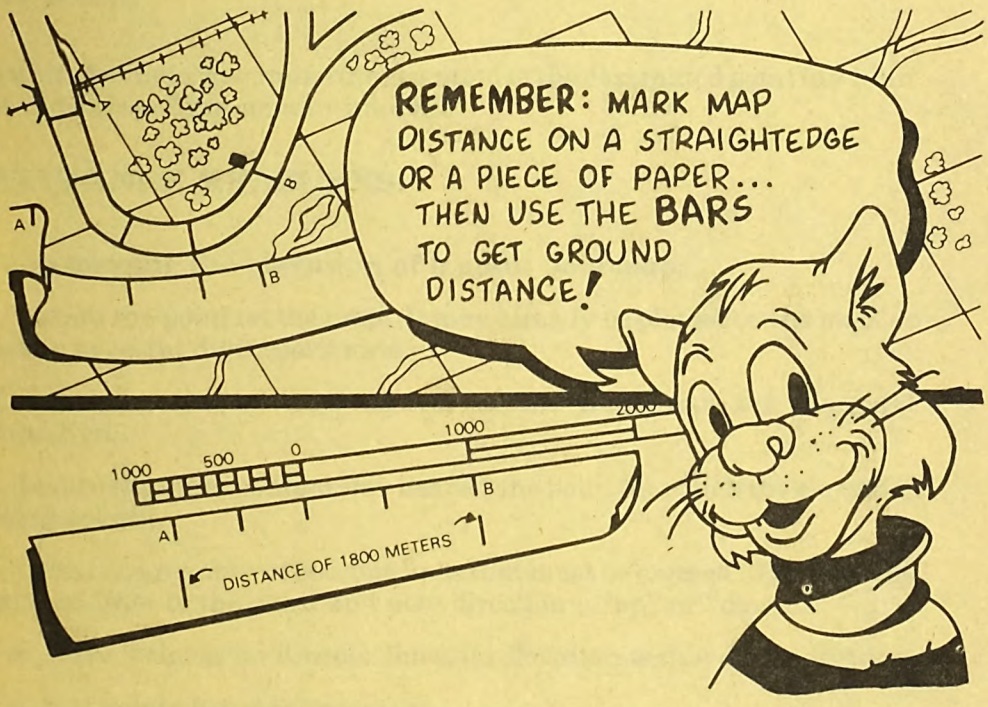
Normally, you will be required to measure distance in meters and you may receive a problem that goes off the bar scale. The meter bar scale allows you to measure distances up to 5,000 meters. If you have to measure distances greater than 5,000 meters, follow this procedure:

a. Step A. Place your starting point on the paper under the zero on the bar scale. Measure off 4,000 meters and place a new tick mark at that point on your paper.

b. Step B. Place this second tick mark also under the zero on the bar scale and determine if the distance on the paper now falls within the bar scale. If it does, add this value to 4,000 to give you your total distance. If it does not, repeat Step A until the distance on the paper falls within the bar scale. Remember to add this last value to the total number of meters you've already measured.



REFERENCES:

FM 21-26, Map Reading, C1, 19 Jan 69 (Chap 4, para 4-3, page 4-2)
TC 21-26, Don't Get Lost, Oct 72 (pages 10-13)
TEC Lesson 930-071-0014-F, Measuring Distances and Azimuths

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TASK NUMBER: 071-329-1004

DETERMINE THE ELEVATION OF A POINT ON THE GROUND USING A MAP.

CONDITIONS:

Given a standard 1:50,000 scale military map, pencil, a designated point on the map, and a requirement to determine the elevation of that point.

STANDARDS:

Within 1 minute, determine the elevation of the designated point to within ½ of the value of the contour interval.

PERFORMANCE MEASURES:

To determine the elevation of a point on a map:

1. Locate the point on the map. (It may already be plotted on the map, or given as an eight-digit coordinate.)

2. Determine the contour interval of the map from the marginal information.

3. Locate the index contour line nearest the point for which the elevation is being sought.

4. Count the number of contour lines that must be crossed to go from the numbered lines to the point and note direction -- "up" or "down".

a. If the point is on contour lines, its elevation is that of the contour.

b. For points between contours:

(1) Points less than one-fourth the distance between lines are considered to be the same as the elevation of the nearest line.

(2) Points one-fourth to three-fourths the distance from the lower line are considered to be at an elevation half the contour interval above the lower line.

c. To estimate elevation of the top of an unmarked hill, add half the contour interval to elevation of highest contour line around the hill.

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d. To estimate the elevation of the bottom of a depression, subtract half the contour interval from the lowest contour around depression.

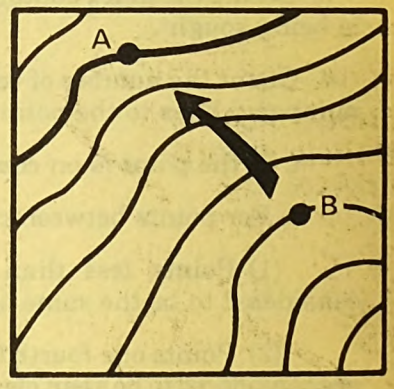
e. On maps that do not show elevation and relief in as much detail as needed, supplementary contour lines may be used. Marginal information indicates the interval, and the supplementary lines are used exactly like solid contour lines.

f. Bench marks and spot elevation also indicate points of known elevation.

...and this is abou

CONTOUR LINES

The brown lines on the map are calle CONTOUR lines. Each line shows the heigh above sea level. Contour lines never cross on another. Printed at the bottom of the map i the CONTOUR INTERVAL, which is th difference in height (elevation) between on brown line and the one next to it. On a ma with a scale of 1:50,000 contour interval i usually 20 feet. This would make point "A" 8 feet higher or lower than point "B."



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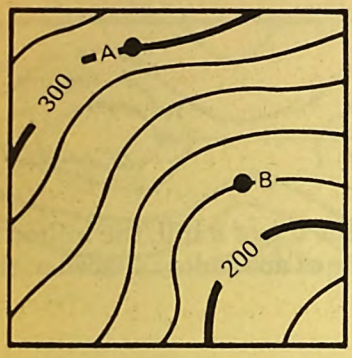
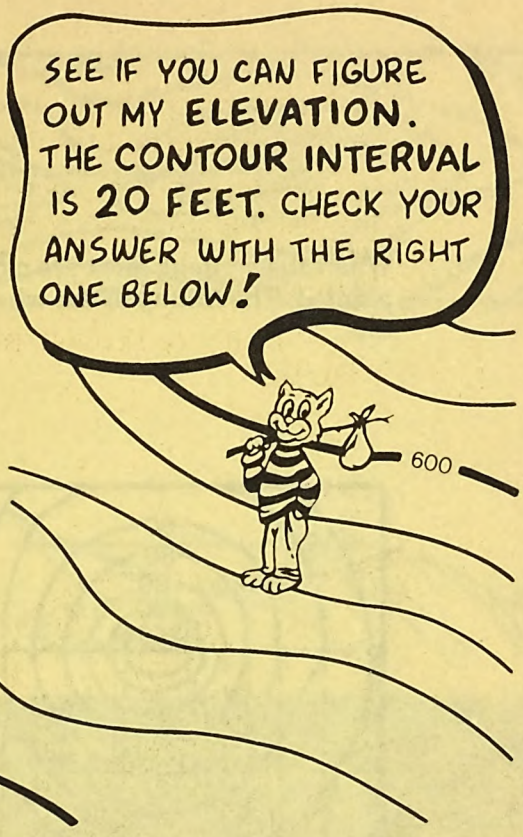
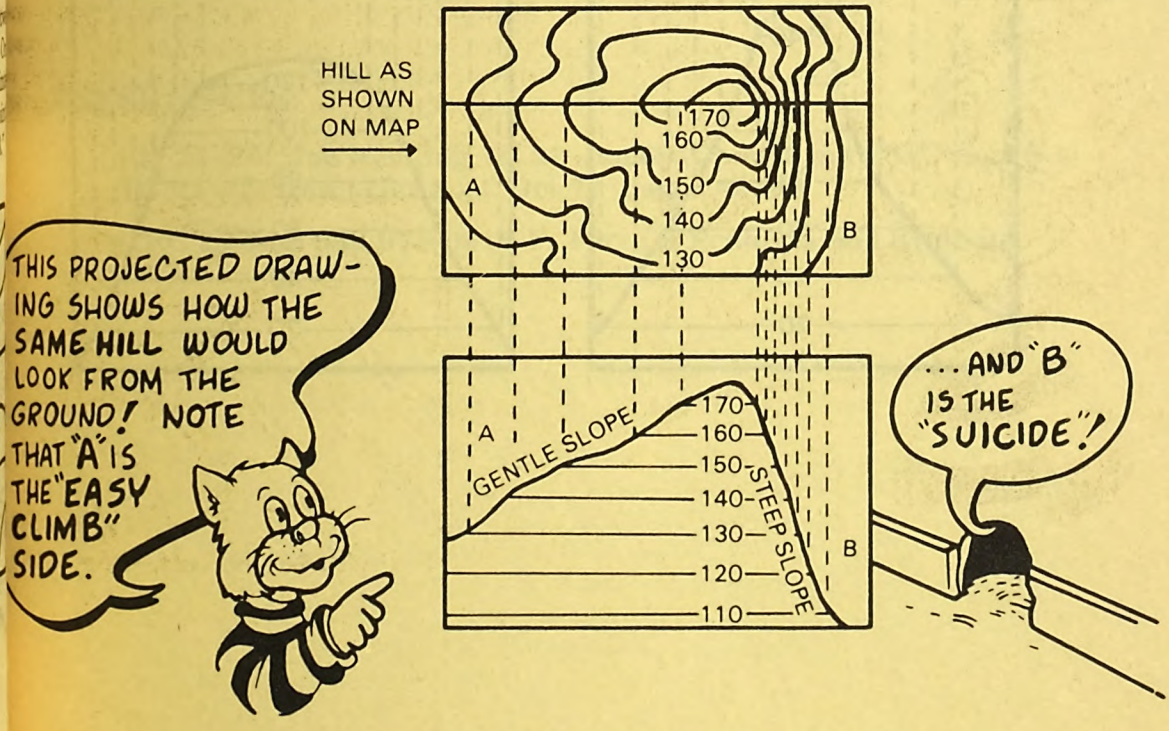


ow can you tell from the brown lines hether it's uphill or downhill? Well, every fth line is heavier than the rest and has a umber that gives its elevation. Let's say iat the contour interval is 20 feet again. ow you can tell that point "A" is 80 feet igher than point "B." Also, if you knew the round distance between "A" and "B," you ould get an idea of how steep the slope was.


SEE IF YOU CAN FIGURE OUT MY ELEVATION. THE CONTOUR INTERVAL IS 20 FEET. CHECK YOUR ANSWER WITH THE RIGHT ONE BELOW!
600
500
400
ANSWER: 560 feet

Contour lines widely spaced show a gentle slope. When they are close together the slope is steep.



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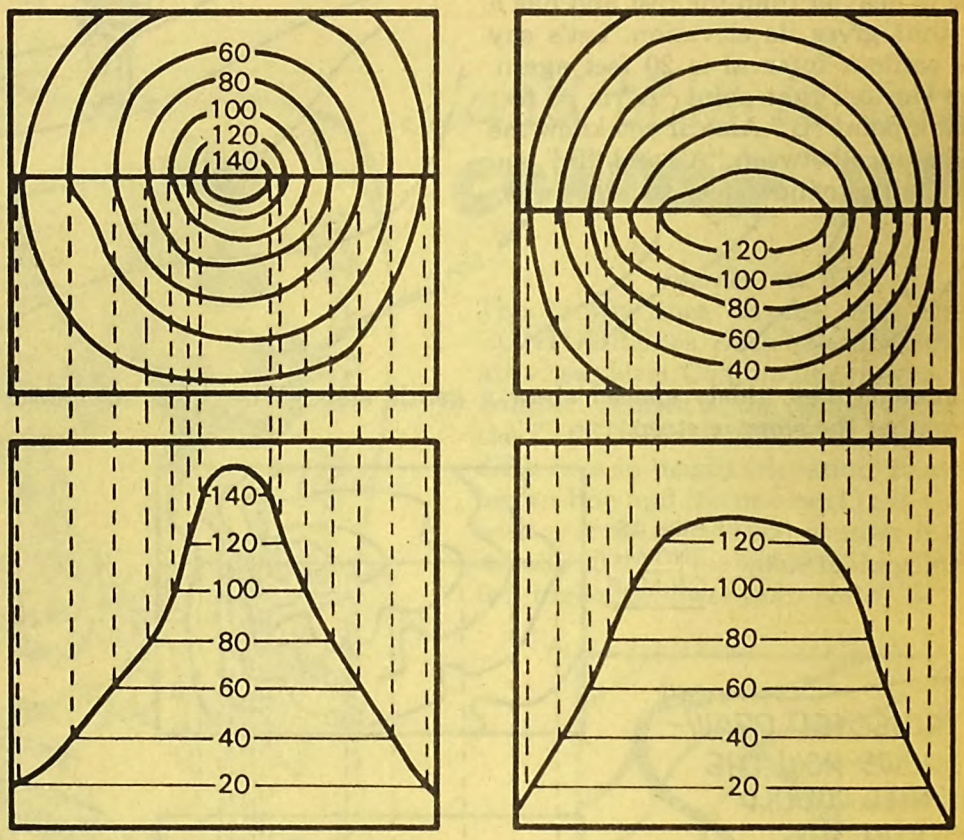
When the contour lines are close together at the top of a hill, the hilltop is pointed. The hilltop is flat when the contour lines are widely spaced at the top.



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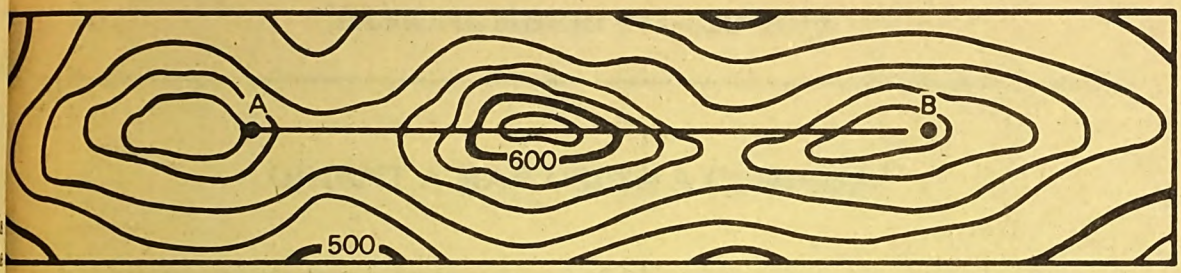

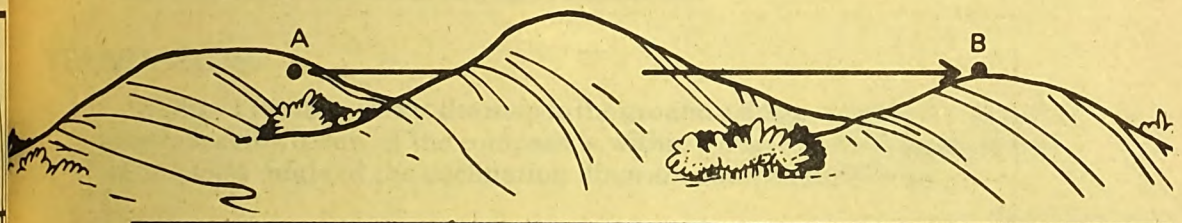

REMEMBER: A contour line is a brown line on your map that connects points of the same elevation. You can find the contour interval in that margin at the bottom of your map. The heavy brown lines (every fifth one) have the elevation printed on them. You can tell from looking at your map what the slopes, hills, and valleys will look like on the ground.

REFERENCES:

FM 21-26, Map Reading, C1 20 Jan 69 (Chap 6, para 6-2, page 6-1)
TC 21-26, Don't Get Lost, Oct 72 (pages 42-46)

TEC Lesson 930-071-0016-F, Terrain Features and Symbols

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TASK NUMBER: 071-329-1011

ORIENT A MAP USING A COMPASS

CONDITIONS:

Given a standard 1:50,000 scale military map and lensatic compass, in a field environment, under daylight conditions.

STANDARDS:

Within 1 minute, orient the map to the ground using a compass so that the north-seeking arrow of the compass is within 3 degrees of the angle shown in the G-M angle of the declination diagram shown on the map.

PERFORMANCE MEASURES:

1. With the map in a horizontal position, the compass is placed parallel to a north-south grid line with the cover side of the compass pointing toward the top of the map. This will place the black index line on the dial of the compass parallel to grid north. Since the needle on the compass points to magnetic north, we have a declination diagram on the face of the compass formed by the index line and the compass needle.

2. Rotate map and compass until the directions of the declination diagram formed by the black index line and the compass needle match the directions shown on the declination diagram printed on the margin of the map. The map is then oriented.

3. If the magnetic north arrow on the map is to the left of grid north, the compass reading will equal the G-M angle (given in the declination diagram). If the magnetic north is to the right of grid north, the compass reading will equal 360° minus the G-M angle.

4. Remember to point the compass north arrow in the same direction as the magnetic north arrow (2 above), and the compass reading (equal to the G-M angle or the 360° minus G-M angle) will be quite apparent.

5. Some maps have a built-in protractor consisting of a pivot point "P" on the south neatline of the map and several degrees of arc along the north neatline of the map. The G-M line is obtained by connecting pivot point "P" with the appropriate value of the G-M angle (taken from the declination diagram) on the arc. The map may then be oriented by placing the compass parallel to this line and rotating the map and compass until the needle point is alined with the continuous line formed by the index line and the sighting wire. The map is then oriented.

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6. An alternate method is to draw a magnetic north line on the map from any N-S and E-W grid line intersection using the protractor. Aline the straightedge of the compass along this magnetic north line and rotate the map and compass together until the north arrow falls beneath the fixed black index line on the compass.

NOTE: If G-M angle is less than 3 degrees, do not line up north arrow.

REFERENCE:

FM 21-26, Map Reading, C1, Jan 69 (chap 5, page 5-10, para 5-7)
TEC Lesson 930-071-0018-F, Land Navigation with Map and Compass

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TASK NUMBER: 071-329-1005

DETERMINE A LOCATION ON THE GROUND BY TERRAIN ASSOCIATION

CONDITIONS:

In the field during daylight hours, while at an unknown location on the ground, given a standard 1:50,000 scale military map of the area, a coordinate scale and protractor, a known point on the ground, and a requirement to determine the six-digit map coordinates of the location.

STANDARDS:

Within 15 minutes, determine the six-digit grid coordinates of your location to within 100 meters.

PERFORMANCE MEASURES:

1. Determine the four cardinal directions (north, south, east, and west).
2. Determine the type of terrain feature on which you are located.
3. Determine what types of terrain features surround the location.
4. Orient the map.
5. Relate the terrain features on the ground to those shown on the map.
6. Having determined where the terrain features on the ground and those on the map coincide, determine the coordinate location of that point using the coordinate scale and protractor.

REFERENCE:

TEC Lesson 930-071-0018-F, Land Navigation with a Map and Compass

TEC Lesson 930-071-0163-F, Determine a Location on the Ground

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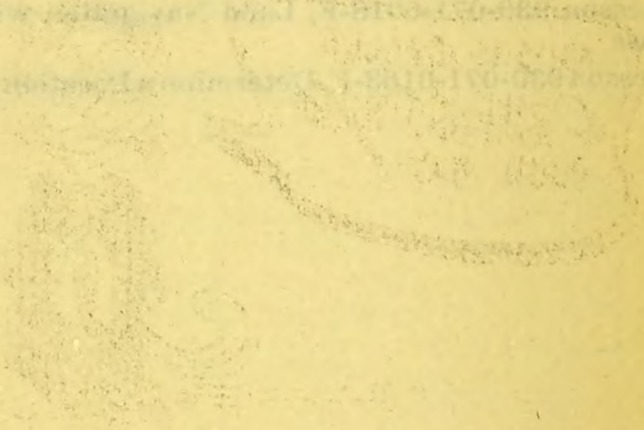

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TASK NUMBER: 071-329-1012

ORIENT A MAP TO THE GROUND BY MAP-TERRAIN ASSOCIATION.

CONDITIONS:

Given a standard 1:50,000 scale military map in a field site, under daylight conditions.

STANDARDS:

You must orient the map to north within 30° in 10 minutes.

PERFORMANCE MEASURES:

1. There are many good ways that you can use to locate your position on your map, but first you have to do one important thing.

> You've got to point your map so that NORTH, SOUTH, EAST and WEST on the map POINT THE SAME WAY as they do ON THE GROUND.

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Look at the map and the ground to find two linear features common to both, such as hilltops, saddles, valleys, ridges, and depressions. By alining the features on the map with the same feature on the ground (figure 1 and 2) the map is oriented.

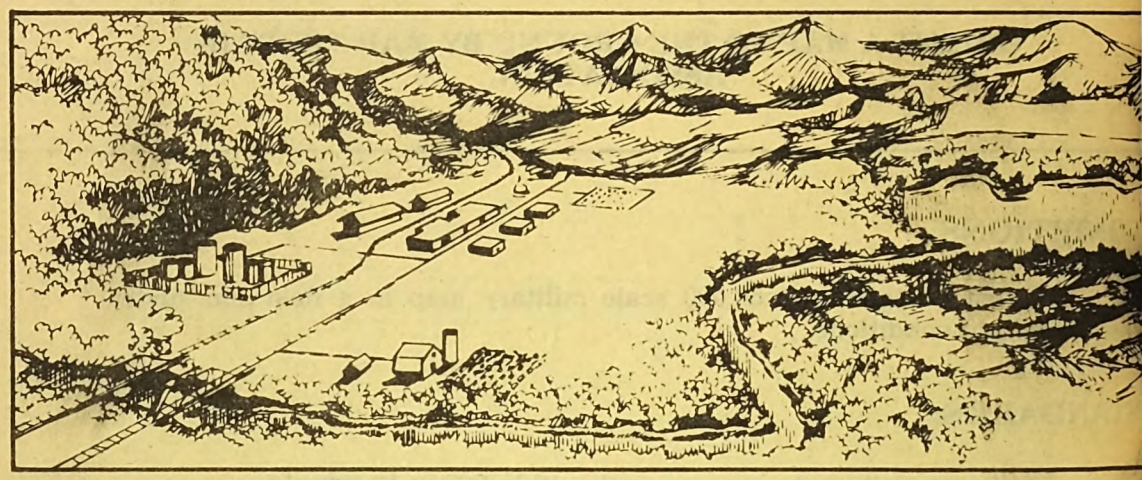

Figure 1. An area as viewed from a ground position.

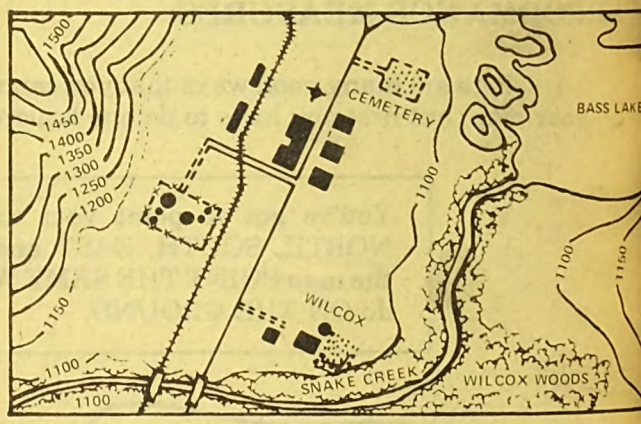

Figure 2. Map of the same area as in figure

REFERENCES:

FM 21-26, Map Reading, C1, 20 Jan 69 (chap 5, para 5-7, page 5-10)
TC 21-26, Don't Get Lost, Oct 72
TEC Lesson 930-071-0161-F, Orient a Map by Terrain Association

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION III
WEAPONS

TASK SUMMARIES

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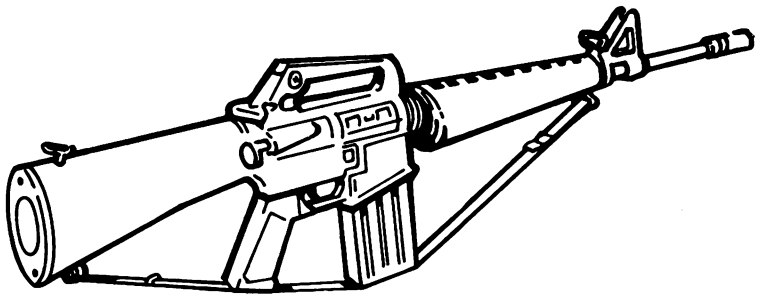
INTRODUCTION
M16A1 RIFLE

FACTS ABOUT YOUR RIFLE

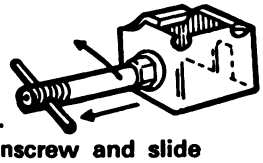


The M16A1 rifle system consists of a rifle, one magazine, and a sling. It is a lightweight, gas-operated, air-cooled, magazine-fed, shoulder-fired weapon that can be fired either automatically or semiautomatically.

Other features:

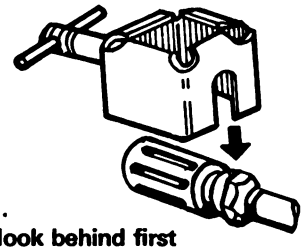
The barrel assembly has an adjustable sight and a flash suppressor.
Upper and lower receivers are easily opened for cleaning and inspection.
Bolt group and barrel extension are designed with locking lugs that lock bolt group to barrel extension.
An aluminum receiver reduces the weight of the rifle.
Some rifles are equipped with the Low Light Level Sight to increase effectiveness during periods of limited visibility.

M15A2 BLANK FIRING ATTACHMENT (BFA)



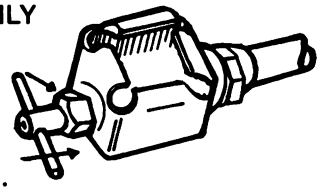
1. **Unscrew and slide all the way back**

NOTE: After 50 rounds, check to see if it is still tight. Make sure to clean carbon buildup after each use



2. **Hook behind first groove of flash suppressor**

CAUTION: Do not use tools to tighten attachment, HANDS ONLY



3. **Slide into flash suppressor and HAND TIGHTEN**

WARNING	Use ONLY blank M200 with the BFA

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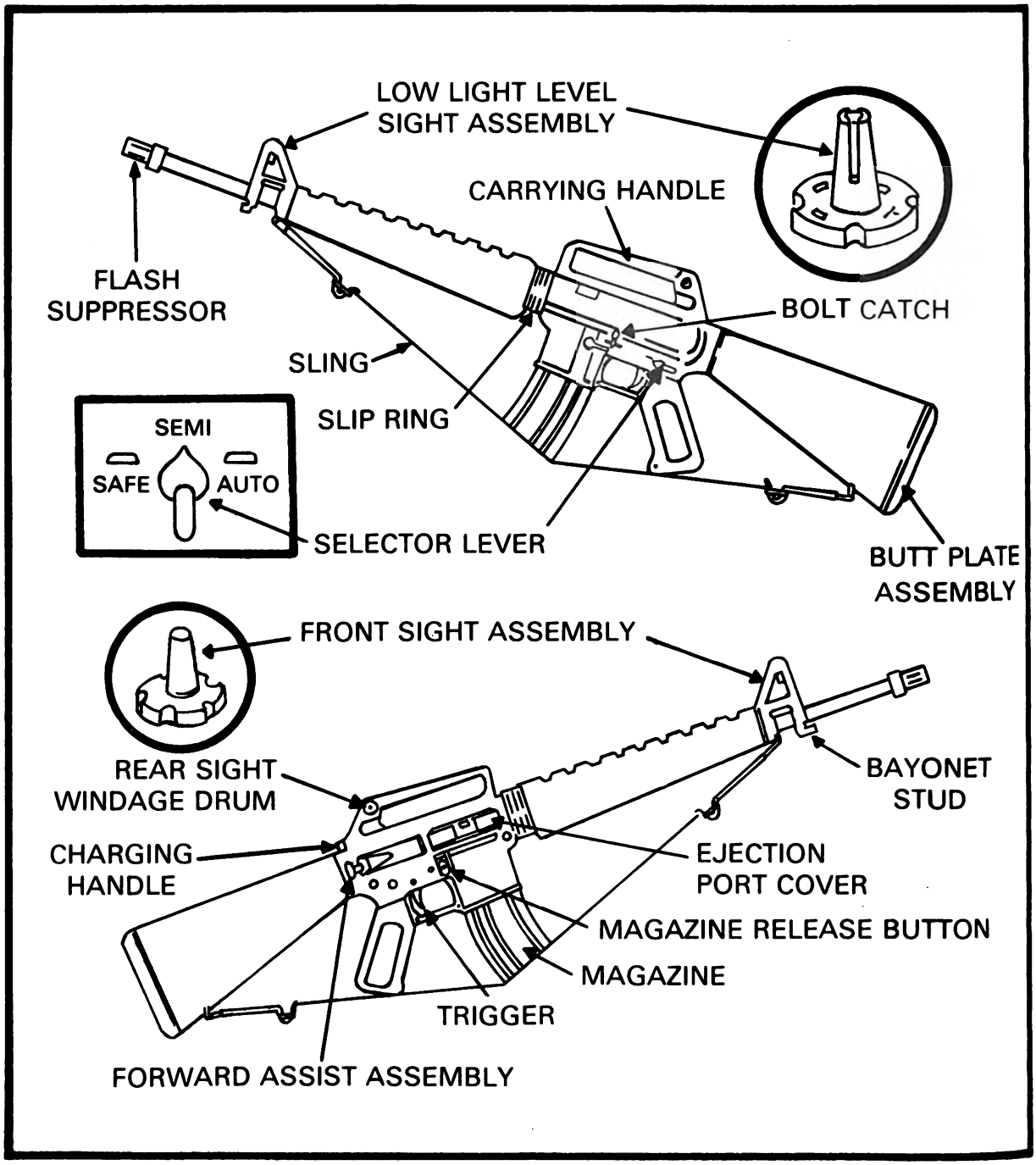
RIFLE PARTS AND WHERE THEY ARE



2-III-A.2

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TASK NUMBER: 071-311-2001

PERFORM OPERATOR MAINTENANCE ON AN M16A1 RIFLE, MAGAZINE, AND AMMUNITION

CONDITIONS:

Given an M16A1 rifle, magazine, 5.56-mm ammunition (combat only), and small arms maintenance equipment case (FSN 8465-00-781-9564).

STANDARDS:

1. Disassemble M16A1 rifle IAW performance measures for disassembly.

2. Clean and lubricate M16A1 rifle IAW performance measures for cleaning and lubricating.

3. Assemble M16A1 rifle IAW performance measures for assembly and conduct a function check.

4. Disassemble, clean and lubricate, then assemble rifle magazine IAW performance measures for care of the rifle magazines.

PERFORMANCE MEASURES:

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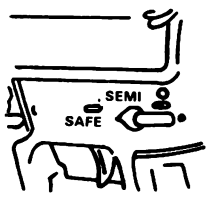
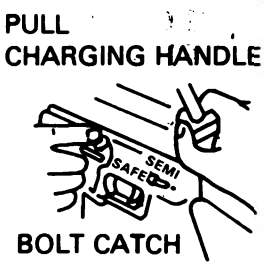
CLEAR YOUR RIFLE

1 Place selector on SAFE. If weapon is not cocked, lever cannot be pointed toward SAFE.

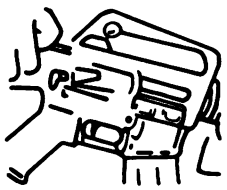


2 Remove magazine.

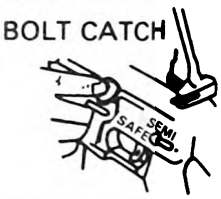
3 To lock bolt open, pull charging handle rearward, press bottom of bolt catch, allow bolt to move forward until it engages bolt catch. Return charging handle to forward. If you haven't before. place on SAFE.



4 Eyeball receiver and chamber to insure these areas contain no ammo.



5 With selector lever pointing toward SAFE, allow bolt to go forward by pressing upper portion of bolt catch.



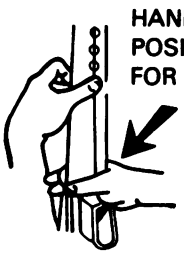
DISASSEMBLY

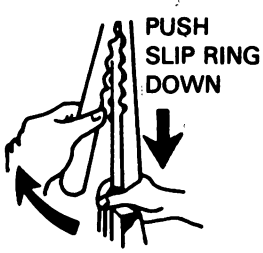
1 first CLEAR YOUR RIFLE

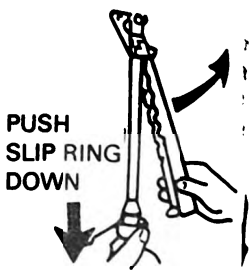
2 Remove sling.

NOTE

Remove & clean only if dirt & corrosion can be seen through vent holes.







3 Remove handguards.

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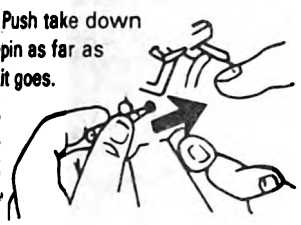
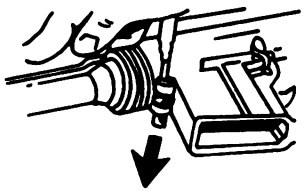
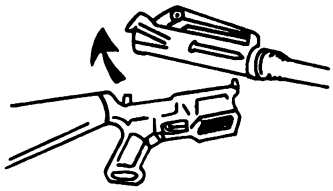
ISASSEMBLY (cont).



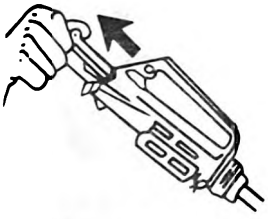
4 Pivot upper receiver from lower receiver.



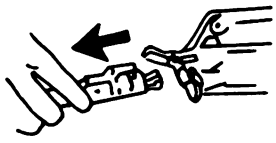
5 Push receiver pivot pin.



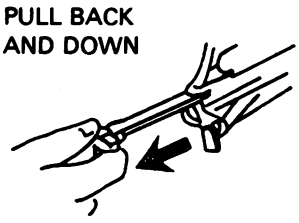
6 Separate upper and lower receivers.



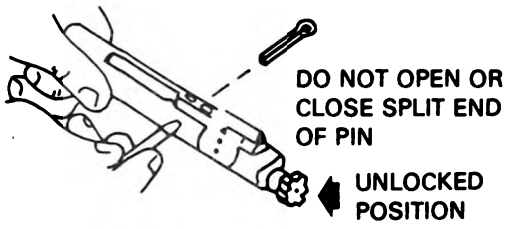
7 Pull back charging handle and bolt carrier.



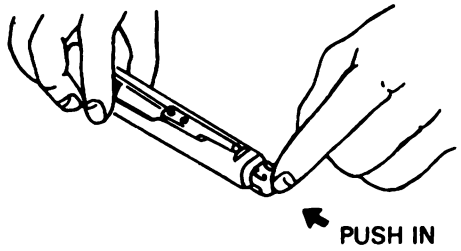
8 Remove bolt carrier and bolt.



9 Remove charging handle.

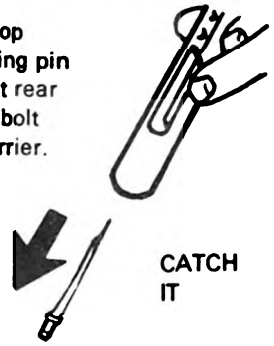


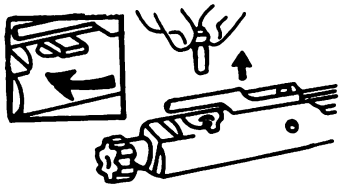
10 Remove firing pin retaining pin.



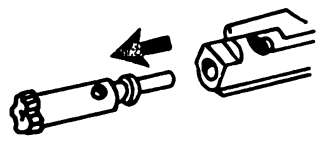
11 Put bolt assembly in lock position.

12 Drop firing pin out rear of bolt carrier.





13 Remove bolt cam pin.



14 Remove bolt assembly from carrier.

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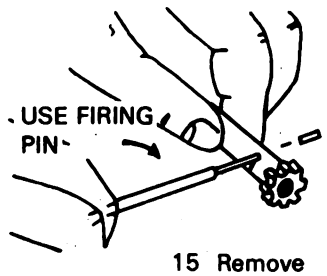
PERFORM STEPS 15 THRU 18 ONLY WHEN DIRTY OR DAMAGED



15 Remove extractor pin.

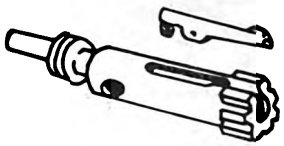
NOTE

Press top of extractor to check spring function.

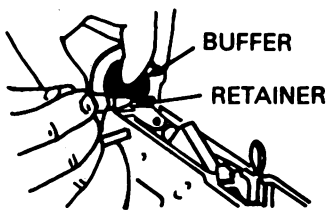
See your ARMORER

Do not damage tip of firing pin.

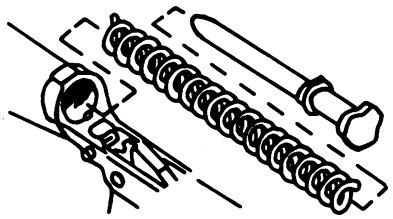
DON'T SEPARATE SPRING FROM EXTRACTOR



16 Remove extractor and spring.



17 Press in buffer, depress retainer and release buffer.



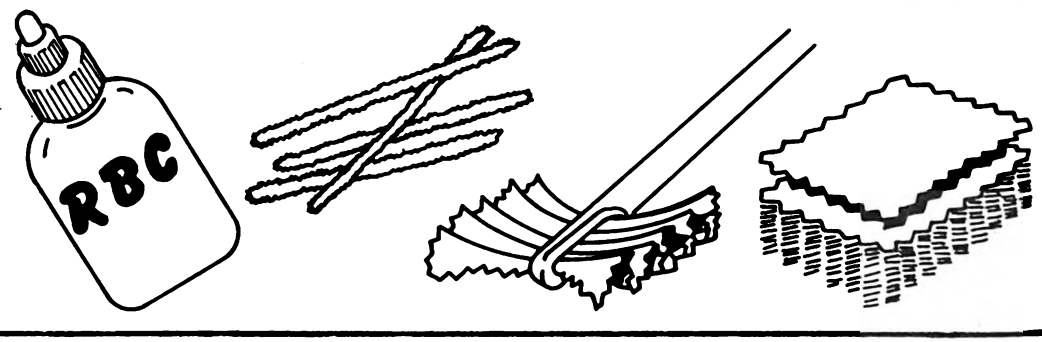
18 Remove buffer and spring.

NO FURTHER DISASSEMBLY ALLOWED

CLEAN . . . INSPECT . . . LUBE

With the rifle disassembled, thoroughly clean, inspect and lube, so you have a reliable weapon you can always depend on.

After firing, clean your weapon for 3 consecutive days with rifle bore cleaner (RBC). Wipe dry and lube according to lubrication instructions.



Cleaning materials: swabs, pipe cleaners, and RBC are expendable items that are available from company supply.

If any parts are missing or defective, see your ARMORER.

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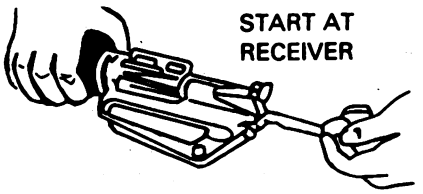
LEANING upper and lower receiver group

CLEAN WITH RBC

- All Areas of Powder Fouling, Corrosion, Dirt & RUST
- Bore & Chamber
- Locking Lugs
- Gas Tube



GO RIGHT THRU THE FLASH SUPPRESSOR

BORE BRUSH (DON'T REVERSE DIRECTION WHILE IN BORE)

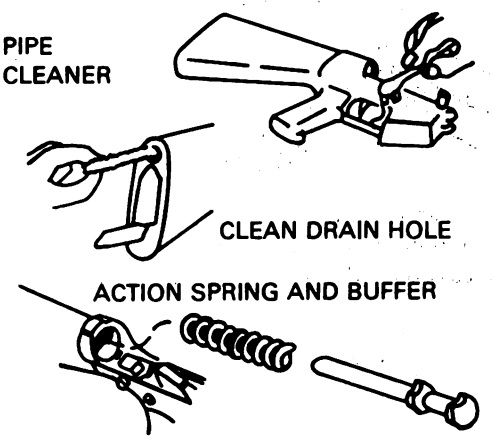
BARREL LOCKING LUGS AND GAS TUBE

Use a worn bore brush to get outside surface of protruding gas tube (get sides and bottom from bottom of receiver)

- All Areas of Powder Fouling, Corrosion, and Dirt
- Wipe Dirt from Trigger Mechanism
- Clean Buffer and Inside Lower Receiver Extension

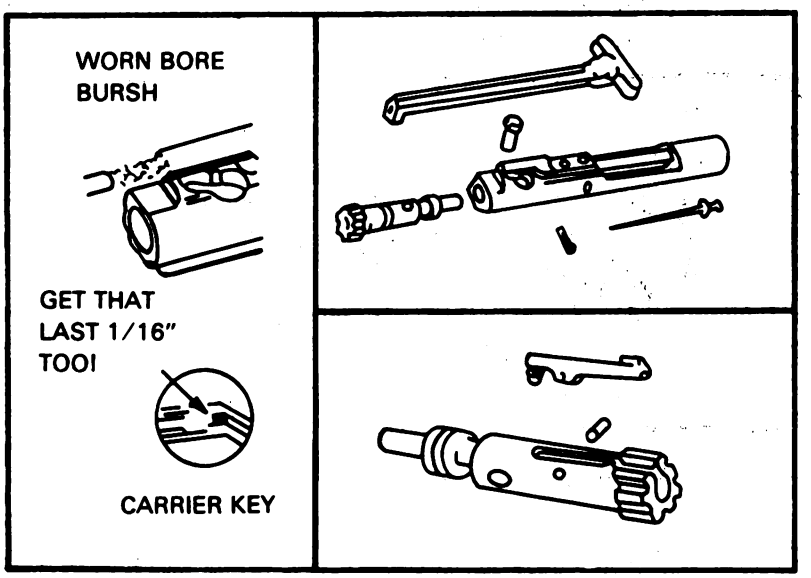
CAUTION

Do not use wire brush or any type of abrasive material to clean aluminum surfaces



LEANING bolt carrier group

- Outer & Inner Surfaces of Bolt Carrier
- Carrier Key
- Firing Pin Recess and Firing Pin
- Firing Pin Hole (Use Pipe Cleaner There)
- Carbon Deposits & Dirt from Locking Lugs
- Areas Behind Bolt Ring and Under Lip of Extractor



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LUBE GUIDE

Under all but the coldest arctic conditions, LSA is the lubricant to use on your rifle. Remember to remove excessive oil from the bore before firing.

Lightly Lube - A film of oil barely visible to the eye.

Generously Lube - Heavy enough so that it can be spread with the finger.

3. Care and Cleaning.

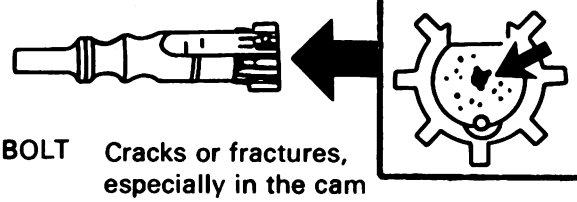
a. **Cleaning Rifle.** Clean and lightly lubricate with LSA the lugs in barrel extension, bore, and chamber. Clean and lightly lubricate the bolt carrier. Lubricate slide cam pin area, piston rings, outside bolt body, and in bolt carrier key.

(CAUTION: Apply only a light coat of LSA to firing pin and firing pin recess.)

Use rifle bore cleaning compound (RBC) to clean powder fouling in the upper receiver. Clean outside surface of protruding gas tube with a worn bore brush. Coat all other surfaces with lubricant. Apply a light coat of LSA to buffer, action spring, and inner surfaces of lower receiver extension. Use generous amount inside lower receiver and on all components.

INSPECT - before assembly

WARNING: DO NOT interchange bolts between rifles



BOLT Cracks or fractures, especially in the cam pin hole area. Bolts that contain pits extending into the firing pin hole need replacing

FIRING PIN RETAINING PIN - Bent, busted, badly worn

CAM PIN - Cracked, chipped or missing

EXTRACTOR AND EXTRACTOR SPRING Check extractor for chipped or broken edges in the area of the lip that engages the cartridge rim.

FIRING PIN - Bent, cracked or blunted end

IF PARTS ARE MISSING OR DEFECTIVE, SEE YOUR ARMORER

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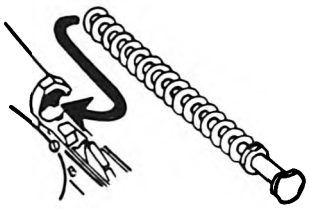
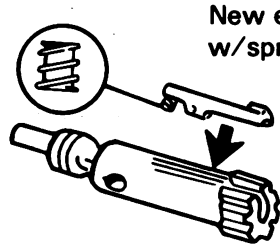
ASSEMBLY



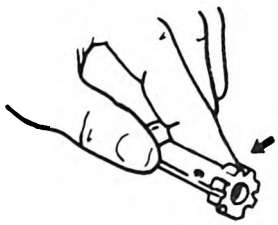
1 Insert spring and buffer

New extractor has a silicone insert w/spring. Be sure not to lose it

If the spring comes loose, put the large end of spring in the extractor and seat

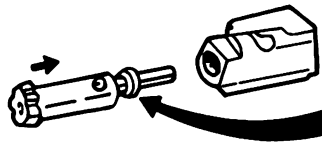


2 Insert extractor and spring

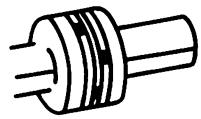


3 Push in extractor pin

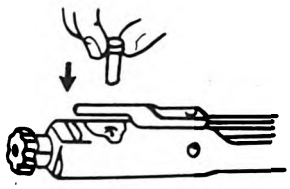
WARNING
Don't switch bolts between rifles



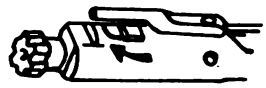
4 Slide bolt into carrier



STAGGER RING GAPS TO STOP GAS LOSS

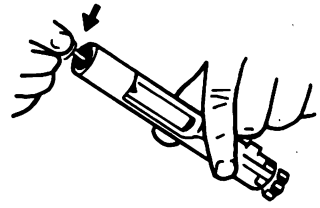


5 Replace bolt cam pin

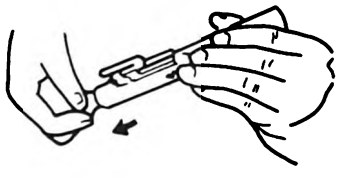


GIVE CAM PIN A ¼ TURN AFTER ASSEMBLY

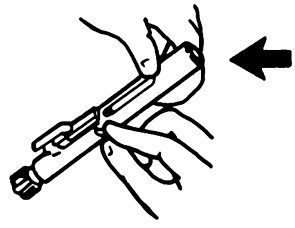
FIRING PIN



6 Drop in and seat



7 Pull bolt back



NOTE

Firing pin should not fall out when bolt carrier group is turned upside down

8 Replace retaining pin

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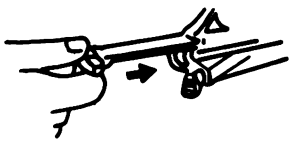
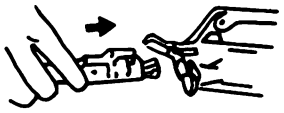
ASSEMBLY (cont).

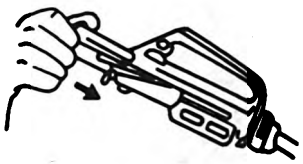


9 Engage, then push charging handle part way

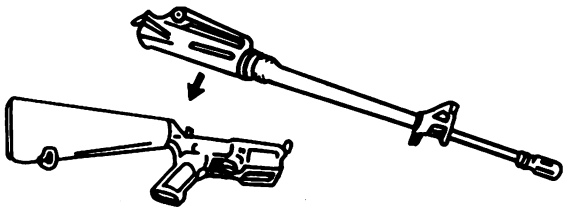
BE SURE BOLT IS STILL UNLOCKED



10 Slide in bolt carrier group



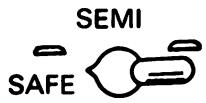
11 Push in charging handle and bolt carrier group together

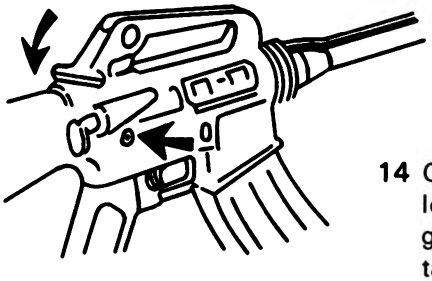


12 Join upper and lower receivers

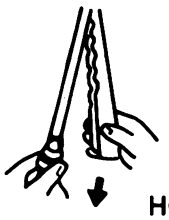
13 Engage receiver pivot pin

CAUTION:
Selector lever must be on safe or semi before closing upper receiver





14 Close upper and lower receiver groups. Push in takedown pin



HOLD SLIP RING DOWN

CHECK FOR FULL ENGAGEMENT

15 PUT HANDGUARDS IN PLACE

16 Replace sling

DID YOU INSTALL EVERYTHING?

2-III-A-1.8

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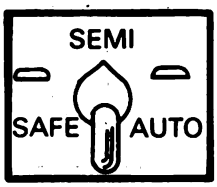
FUNCTIONAL CHECK cont.

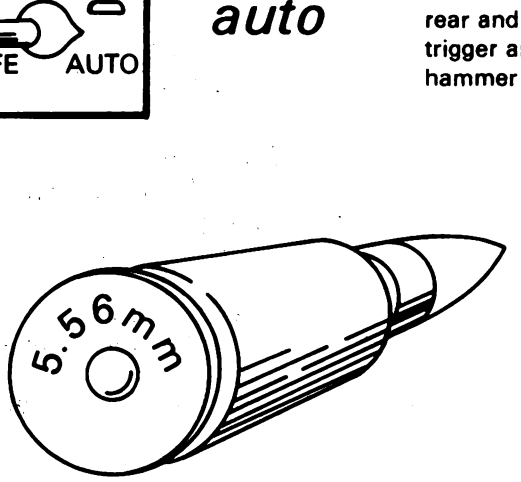


semi

Place selector in semi. Pull trigger and hold to rear. Hammer should fall. Pull charging handle to rear and release. Release trigger and pull again. Hammer should fall.

auto

Place selector in auto. Pull charging handle to rear and release. Pull trigger and hold to rear, hammer should fall. Pull charging handle to rear and release. Release trigger and pull again. Hammer should not fall.



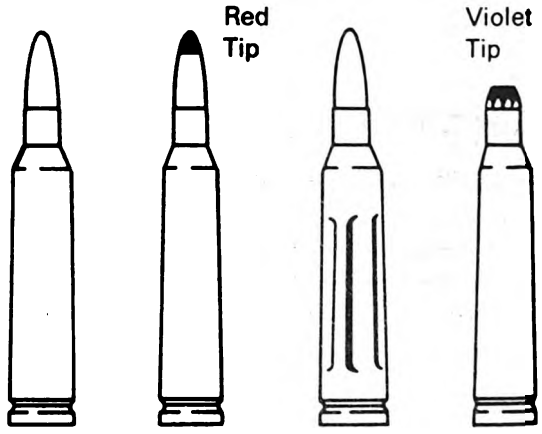
AMMUNITION

WARNING

DO NOT FIRE . . .

- Seriously corroded ammunition
- Dented cartridges
- Cartridges with loose bullets
- Cartridges exposed to extreme heat (135°) until they have cooled

Use only authorized ammo that is manufactured to US specs.



Ball, M193 | Tracer, M196 | Dummy, M199 | Blank, M200

KEEP DRY, CLEAN, AND FREE OF CRUD. YOUR LIFE DEPENDS ON IT!

Cleaning Ammunition. Use a clean, dry cloth to wipe dirt and foreign matter from ammunition. Do not coat with oil.

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SARGE'S INSPECTION

Sarge'll gig ya if the following items are not clean . . . .

BOLT,
SIGHTS,
RECEIVER,
CHARGING HANDLE,
HANDGUARDS,
GAS TUBE & PORTS,
STOCK DRAIN HOLE,
BORE & FLASH SUPPRESSOR,
MAGAZINE CATCH &
MAGAZINE WELL

He'll also check the overall condition of the SIGHTS, BIPOD, STOCK, & HANDGUARDS.

So, be prepared, keep it clean and lubed.

REFERENCES:

TM 9-1005-249-10, Operator's Manual, Apr 77 (pages 9 thru 33)
TEC Lesson 939-071-0010-F, Disassembly and Assembly of the M16A1 Rifle
TEC Lesson 939-071-0011-F, Maintaining the M16A1 Rifle
GTA 21-13, M16/M16A1 Rifle Maintenance Card

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TASK NUMBER: 071-311-2003

LOAD, REDUCE A STOPPAGE, AND CLEAR AN M16A1 RIFLE

CONDITIONS:

Given an assembled and operational M16A1 rifle, a magazine loaded with either live or blank ammunition. Performance of this task with blank ammunition can be accomplished either in garrison or in the field. Live firing requirements are only applicable to actual combat situations or range firing.

STANDARDS:

In accordance with the performance measures:

1. Load and chamber a round within 5 seconds.

2. Eliminate stoppages, either real or simulated, within 10 seconds, by using immediate action.

3. Clear the M16A1 rifle within 10 seconds.

PERFORMANCE MEASURES:

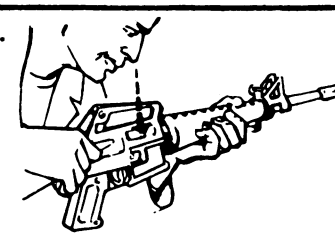
(1) LOADING A ROUND

a.

b.

With hammer cocked, place selector lever on SAFE.

c.

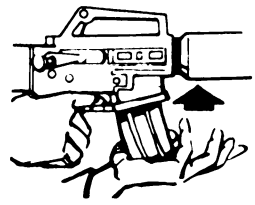


Open bolt and eyeball chamber. Clear?

d.

Push upward until magazine catch engages and holds magazine.

e.



Tap upward to make sure it's seated right.

f.

MAGAZINE MAY BE LOADED WITH BOLT ASSEMBLY OPEN OR CLOSED

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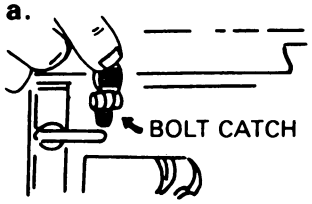
② CHAMBERING A ROUND

BOLT ASSEMBLY OPEN

a.



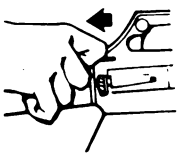
Depress upper portion of bolt catch.

b.

Tap forward assist to insure bolt is fully forward & locked.

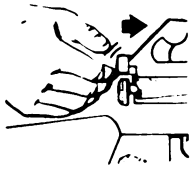
BOLT ASSEMBLY CLOSED

c.



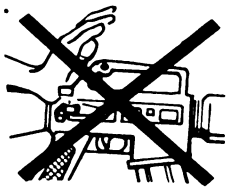
Pull charging handle fully rearward.

d.



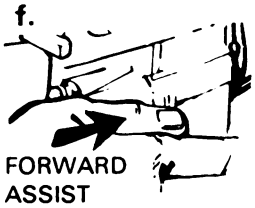
Release the charging handle.

e.



Never "ride" the charging handle. Let it go on its own.

f.

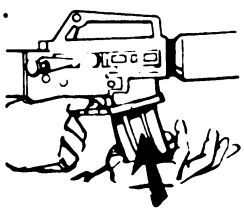


Tap forward assist to insure bolt is fully forward & locked.

③ IMMEDIATE ACTION

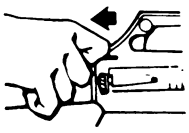
If your rifle stops firing before you do, remember: S-P-O-R-T-S. That key word will help you remember the following actions: **Slap, Pull, Observe, Release, Tap, Shoot.**

a.



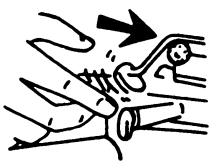
SLAP upward on magazine to make sure it's properly seated.

b.



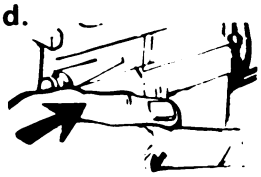
PULL charging handle all the way back. **OBSERVE** ejection of case or cartridge. Eyeball chamber and check for obstruction.

c.



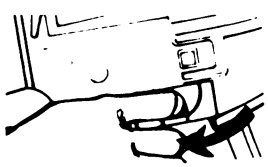
If cartridge or case is ejected or chamber is clear, **RELEASE** charging handle to feed new round. (Don't ride the charging handle.)

d.



TAP forward assist.

e.



Now **SHOOT.** If it won't fire, look for trouble and apply remedial action.

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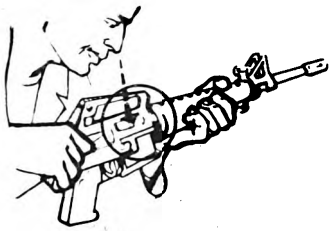
④ REMEDIAL ACTION

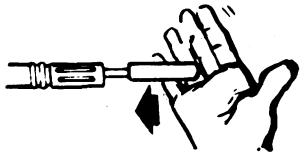
WARNING

If your rifle stops firing with a live round in the chamber of a hot barrel, remove the round fast. However, during training, if you cannot remove it within 10 seconds, wait 15 minutes with the rifle pointing in a safe direction. This way you won't get hurt by a possible ammo cook-off, which could happen 10 seconds after contact with a hot chamber.

a. If your rifle fails to fire after performing steps a thru e for immediate action, check again for jammed cartridge case.



b.



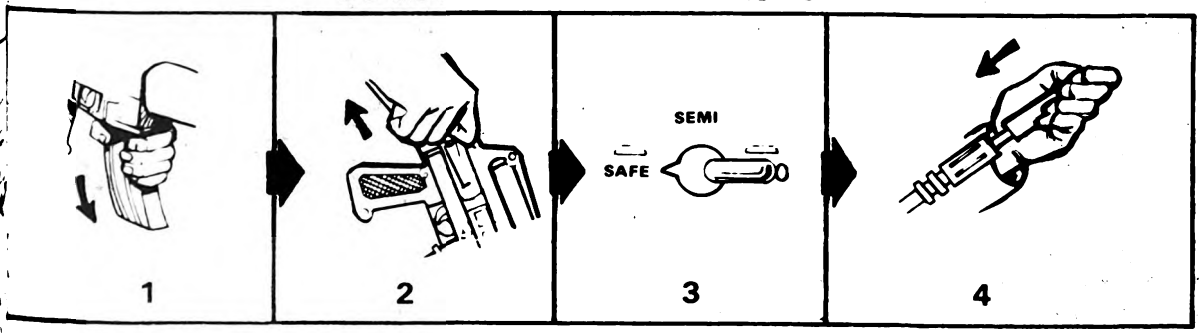
If a cartridge case is in the chamber, tap it out with a cleaning rod.

c. IF YOUR RIFLE STILL FAILS TO FIRE, CHECK TROUBLESHOOTING IN TM 9-1005-249-10, page 48 thru 54.

WARNING

If you hear a "POP" or feel less RECOIL during firing, immediately CEASE FIRE, remove the magazine (1), lock the bolt to the rear (2), and place the selector lever on the "SAFE" position (3). Inspect the bore, or insert a cleaning rod into the bore to insure there is not a round lodged in it (4).

DO NOT APPLY IMMEDIATE ACTION.



If a projectile is lodged in the barrel of the weapon, **DO NOT** attempt to remove it. **Turn the weapon in to the armorer.**

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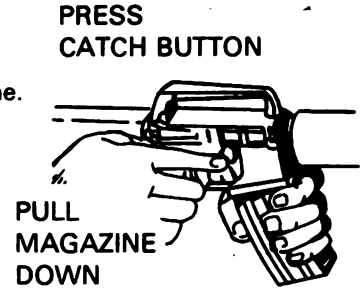
⑤ CLEARING THE RIFLE

a.

Place selector on SAFE. If weapon is not cocked, lever cannot be pointed toward SAFE.

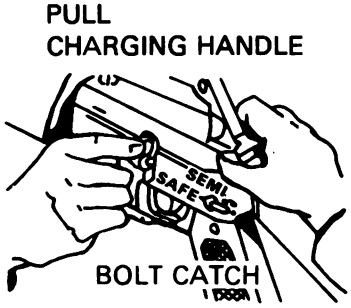
b.

Remove magazine.



c.

To lock bolt open, pull charging handle rearward, press bottom of bolt catch, and allow bolt to move forward until it engages bolt catch. Return charging handle to forward. If you haven't before, place on SAFE.

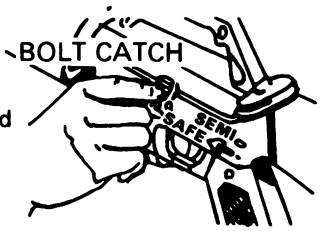


d.

Eyeball receiver and chamber to insure these areas contain no ammo.

e.

With selector lever pointing toward SAFE, allow bolt to go forward by pressing upper portion of bolt catch.



REFERENCES:

TM 9-1005-249-10, Operator's Manual M16A1 Rifle, Apr 77 (pages 11, 36-37, 42-45)
TEC Lesson 939-071-0009-F, Loading and Unloading the M16A1 Rifle
TEC Lesson 939-071-0012-F, Preventing and Correcting Common Malfunctions

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TASK NUMBER: 071-311-2004

BATTLESIGHT ZERO AN M16A1 RIFLE

CONDITIONS:

On a 25-meter firing range, given an M16A1 rifle equipped with either the standard M16A1 sights or the low light level sight system (LLLSS), 18 rounds of 5.56-mm ammunition, battlesight zero target, sandbag for support, and a rifle shot group analysis card: semi-automatic fire with M16A1 and M14 rifles (GTA 21-1-4, Mar 74).

STANDARDS:

Place the center of a three-round shot group at the X - 2.4 centimeters below the Canadian bull's-eye, and have the shot group touch or fall within a 5.2-centimeter-diameter circle centered on the X.

PERFORMANCE MEASURES:

1. **Sights.** The M16A1 rifle has two adjustable sights. Elevation adjustments are made on the front sight and windage adjustments are made on the rear sight. The rifle comes equipped with either the standard sight system or LLLSS.

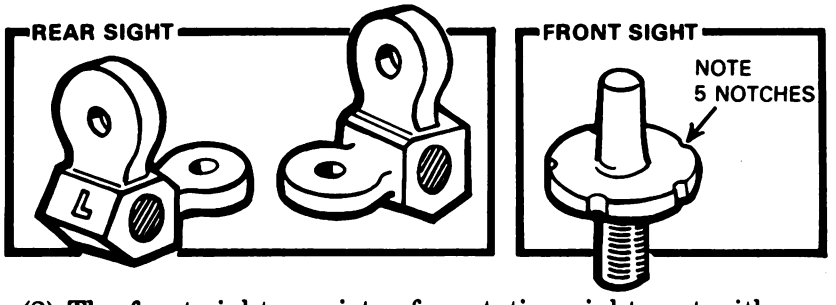
a. The Standard Sight System.

(1) The rear sight has two parts:

(a) An aperture marked "L" for ranges beyond 300 meters and an unmarked aperture for ranges from 0 to 300 meters.

(b) A windage drum for windage adjustments.

STANDARD DAYLIGHT SIGHT



(2) The front sight consists of a rotating sight post with a spring-loaded detent.

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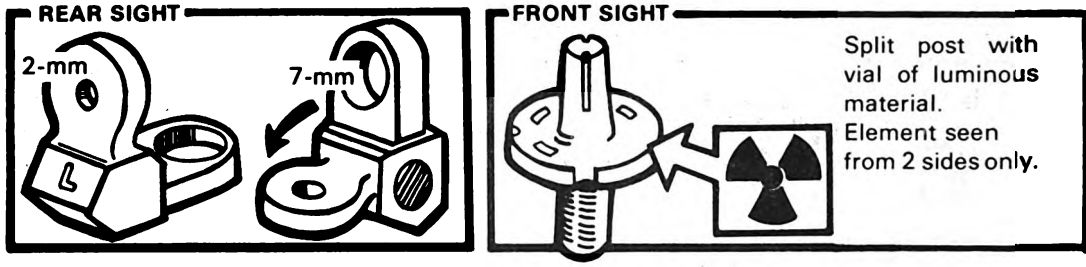
b. The Low Light Level Sight System.

NOTE: Not every rifle will have this sight



(1) The rear sight in this system also has two parts:

(a) A 2-mm aperture marked "L" which is used for zero and ranges to 460 meters under normal conditions. The other aperture (7-mm) is larger than the standard sight and is used for night and limited visibility firing.

(b) A windage drum for windage adjustments (same as standard system).

(2) The front sight has only four notches (clicks) of elevation (the standard system has five). This permits the firer to adjust the sight so he can see the luminous part through the rear sight.

CAUTION: The front sight post contains a small glass vial of radioactive promethium 147. Take care not to bump, abuse, tamper with, or alter the post in any manner. DO NOT blacken or soot-up the front sight.

2. **Sight Adjustment** (low light and standard).

a. Rear Sight. To adjust windage, depress detent and rotate drum to desired direction. To move point of impact to right, turn drum clockwise in direction of arrow and letter R. To move left, move drum counterclockwise. Each graduation (notch) moves the point of impact of bullet as indicated in chart.

b. Front Sight. To adjust elevation, depress detent, rotate post. To raise strike of bullet, rotate post in the direction of arrow marked up. Reverse the direction of rotation to lower strike of bullet. Each graduation (notch) moves the point of impact of bullet as indicated in chart.

IMPACT		DISTANCE
STANDARD	LOW LIGHT LEVEL	
0.7cm (17/62in)	0.9cm (23/64in)	25 meters
2.8cm (1-3/32in)	3.5cm (1-3/4in)	100 meters
5.6cm (2-13/64in)	7.0cm (2-3/4in)	200 meters

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3. **Battlesight Zeroing.**

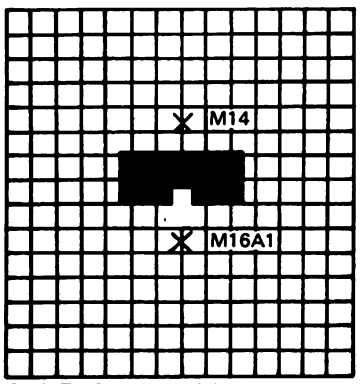
a. Sight Picture. In aiming, the firer is concerned with correctly pointing his rifle so the bullet will hit the target when he fires. To do this, he must have the rear sight, the front sight post, and the target or aiming point in their proper relationship--known as sight picture. A correct sight picture is obtained when the sights are perfectly alined and the aiming point (target) is in the correct relationship to the front sight post (figure 2b). Sight picture includes two basic elements: sight alinement and placement of the aiming point.

b. Sight Alinement. To obtain correct sight alinement, the sights are alined as shown in figure 2a. Notice that the top center of the front sight post is exactly in the center of the rear sight aperture. If an imaginary horizontal line were drawn through the center of the rear sight aperture, the top of the front sight post would touch this line. If an imaginary vertical line were drawn through the center of the rear sight aperture, the line would bisect the front sight post. The firer insures that he has perfect sight alinement by concentrating his attention and focusing his eye on the front sight post through the indistinct or fuzzy appearing rear sight aperture. By doing this, any errors in sight alinement can be easily detected and corrected.

c. Placement of the Aiming Point. The aiming point (target on which the firer has alined his rifle sights) is correctly placed when it is centered on and appears to touch the top of the front sight post (figure 2c). If the aiming point is correctly positioned, an imaginary vertical line drawn through the center of the front sight post will appear to split the front sight post in half.

d. Battlesight Zero Target. The standard 25-meter target (figure 1) is used when determining the battlesight zero for the M16A1 rifle. Vertical and horizontal lines are printed on the target, forming 1.4-centimeter squares. One click of elevation or windage will move the strike of the bullet 0.7 centimeters at a range of 25 meters. Thus, on the 25-meter target, two clicks of elevation or windage will move the strike of the bullet one square.

NOTE: The LLLSS has only four clicks of elevation, but it is adjusted the same as the standard sight. The difference in sight movement per click is not critical during firing.



NOTE: TWO CLICKS OF ELEVATION OR WINDAGE WILL MOVE THE STRIKE OF THE BULLET ONE SQUARE ON THIS TARGET.

Figure 1.

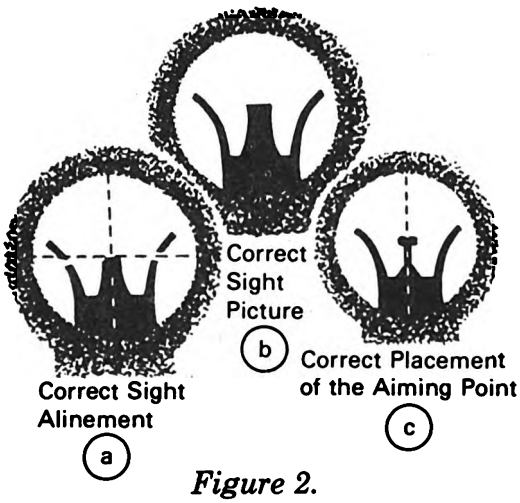


Figure 2.

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e. Determining the Battlesight Zero. The 250-meter battlesight zero is determined by firing a series of three-round shot groups at the 25-meter target. The firer aims at the distinctive aiming point at the bottom center of the black rectangle (base of the white cutaway portion) and adjusts his sights until the center of this acceptable shot group is located 5.2 centimeters directly below the aiming point (figure 3) on or around the X.

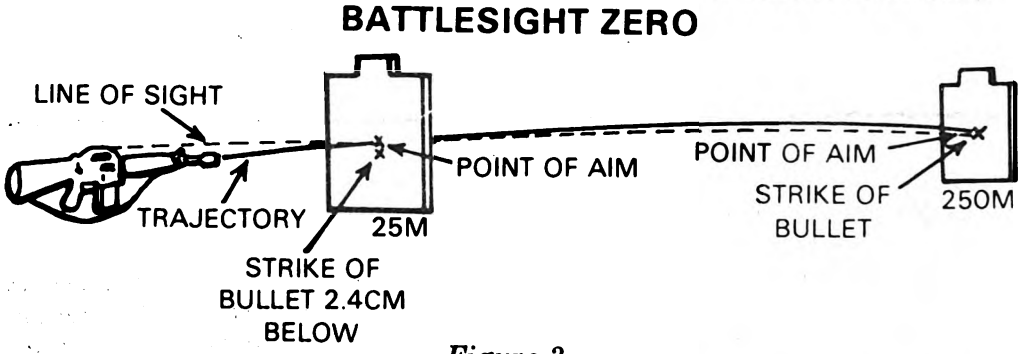

Figure 3.

NOTE: To battlesight zero, adjust your sights so you can hit an aiming point at 250 meters. Zeroing can also be done on a 25-meter range by adjusting the sights so that the bullet will strike 2.4 centimeters below the point of aim. If your M16A1 has an LLLSS and you can't see the vial after zeroing, turn front sight post one click down for use during periods of limited visibility.

4. **Using Low Light Level (Promethium) Sight System.**

a. During daylight firing, use aperture marked L. Effective range is 250 meters (original battlesight zero).

b. At night and in limited visibility, use unmarked (7-mm) aperture. Obtain good sight picture using daylight procedure. After target detection, obtain good sight alinement by centering top of luminous portion of front sight post within 7-mm aperture on target and fire. Under certain light conditions, front sight post can be seen, but you can't determine whether you are looking through, above, or to the side of rear sight aperture. Practice positioning stock against shoulder and looking through rear aperture.

REFERENCES:

FM 23-9, M16A1 Rifle and Rifle Marksmanship, Jun 74 (chap 4, page 83 thru 86)
TM 9-1005-249-10, Operator's Manual, M16A1 Rifle, Apr 77 (pages 34-35; 38-41)
M16A1 Rifle Marksmanship Training Program of Instruction, Apr 77 (all)

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TASK NUMBER: 071-311-2007

QUALIFY WITH THE M16A1 RIFLE

CONDITIONS:

Situation 1: Daylight Firing. On a standard record firing range, given a zeroed M16A1 rifle equipped with either the standard M16A1 rifle sights or the promethium sights, 4 magazines of 10 rounds each, a record fire scorecard, and the requirement to fire record fire for qualification.

Situation 2: Night Firing. On a standard night fire record range, given a zeroed M16A1 rifle equipped with either the standard M16A1 rifle sights or the LLLSS sights, 3 magazines of 3 rounds each for practice firing and 80 rounds for record fire, and the requirement to fire night record fire for qualification.

STANDARDS:

Situation 1: Attain a MINIMUM SCORE of 17 hits out of a possible 40 exposures.

Situation 2: Attain a MINIMUM SCORE of 20 hits out of a possible 40 exposures.

SQT ADMINISTRATION REQUIREMENTS:

SQT credit will be awarded as follows:

Arms Qualification/Evaluation	SQT Points
Unqualified (NO GO)	0
Marksman (GO)	1
Sharpshooter (GO)	1
Expert (GO)	1
Nonobserved	neither counts for nor against total SQT score.

The night-firing portion of arms qualification will not be included in the performance certification component of the SQT.

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QUALIFICATION SCORES AND RATINGS:

	STANDARD RECORD	KNOWN DISTANCE	COURSE "C"
Possible	40	500	42
Expert	28-40	420-500	31 and above
Sharpshooter	24-27	360-419	24-30 inclusive
Marksman	17-23	300-359	11-23 inclusive
Unqualified	16 and below	299 and below	10 and below

NOTE: FM 23-9 superseded FM 23-71; however, premobilization readiness proficiency "C" courses prescribed for use by reserve components were inadvertently omitted from 23-9 as was change 1 to FM 23-71 (Feb 68) which added appendix I for those units which have only known-distance facilities. These courses of fire may be used unless superseded by subsequent instructions. The following conditions and standards are to be used by units that DO NOT have a standard record fire range.

CONDITIONS:

Situation 3: During daylight on a known-distance range (as described in para 5 of appendix I, FM 23-71, change 1), given a zeroed M16A1 rifle, 50 rounds of caliber 5.56-mm ammunition (5 magazines of 10 rounds each to engage each target with 10 rounds), a requirement to fire, Record Firing, Known Distance (total rounds 100) as outlined in para 16d, appendix I of FM 23-71.

Situation 4: During daylight on a 1000-inch range, given a zeroed M16A1 rifle, 42 rounds of caliber 5.56-mm ammunition, a requirement to fire standard course "C" for record fire as outlined in appendix D of FM 23-71.

STANDARDS:

Situation 3: Fire Known-Distance Record Firing Table as outlined in para 16, appendix I of FM 23-71 (change 1) and achieve a minimum score of 300.

Situation 4: Fire Record Fire Course "C" as outlined in appendix D of FM 23-71 and achieve a minimum score of 11.

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WARNING

DANGEROUS PROCEDURES

- Be sure the cam pin is installed in the bolt group. If it isn't, your rifle can still fire, but it could possibly explode, causing you harm.
- DO NOT exchange or switch bolt assemblies from one M16A1 to another . . . It could cause damage to both you and the rifle.
- If your rifle stops firing with a live round in the chamber of a hot barrel, remove the round fast. However, during training, if you cannot remove it within 10 seconds, wait 15 minutes with the rifle pointing in a safe direction. This way you won't get hurt by a possible ammo cook-off, which could happen 10 seconds after contact with a hot chamber.
- Use only authorized ammo that is manufactured to U.S. specs.
- If your bolt fails to unlock and you try to free it by banging the butt stock on the ground, keep yourself clear of the muzzle.
- If there's water in the barrel, don't fire the rifle. It could explode.
- If a noticeable difference in sound or recoil is experienced, STOP FIRING. Either condition could indicate an incomplete propellant burn and a bullet still in the bore. Retract bolt slowly and remove fired cartridge case. Clear weapon and check for unburned powder grains in the receiver or bore and for a bullet in the bore. Remove unburned propellant or bullet from bore before resuming firing, or barrel could explode. If bullet is lodged in bore, turn in rifle to direct support maintenance.

REFERENCES:

FM 23-9, M16A1 Rifle and Rifle Marksmanship, Jun 74 (chap 9, sec II, page 125) (C1, TBP)
FM 23-71, C1, Rifle Marksmanship, Dec 69 (app D, page 171)
TM 9-1005-249-10, Operator's Manual, M16A1 Rifle, Apr 77
M16A1 Rifle Marksmanship Training Program of Instruction, Apr 77 (all)

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TASK NUMBER: 071-311-2006

USE LIMITED VISIBILITY FIRING TECHNIQUES WITH THE M16A1 RIFLE

CONDITIONS:

As a member of a rifle squad in a defensive position during daylight, given an M16A1 rifle, a magazine and ammunition, sticks or rocks and a board or log available in the area, and instructions on the individual's preplanned sector of fire for use during periods of limited visibility.

STANDARDS:

Emplace and aline aiming and firing stakes on identifiable probable enemy avenues of approach, assault positions, and automatic weapons positions, to include left and right limiting stakes (one may be parapet) indicating individual's preplanned sector of fire limits, so that when the weapon is employed using the stakes, rounds:

1. Can be placed in selected target areas/positions.

2. Are all within sector of fire (FPF or fires on sector limits must be grazing fire).

PERFORMANCE MEASURES:

1. Physically locate and identify probable enemy positions and avenues of approach.

2. Prepare field expedient aiming, firing, and limiting stakes (notched stick or tree crotch, figure 1; rocks, board or log, figure 2) which are able to support the weight of your weapon.

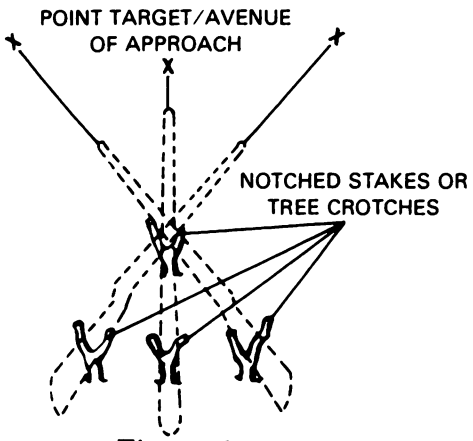

Figure 1.

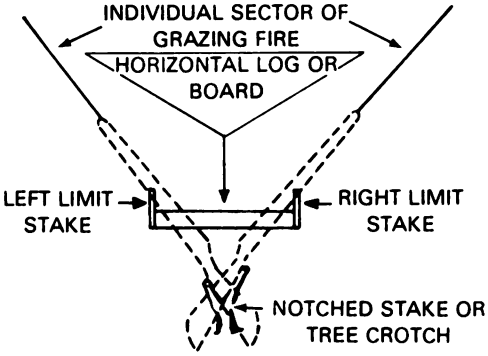

Figure 2.

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3. Insure stakes, horizontal log, or board are well seated into the ground.

4. Place the weapon in the rests (notched stake, tree crotch, log, or board) and aim the M16A1 to hit the desired targets or cover a sector with grazing fire, and adjust the rests to hold the weapon in place.

5. To fire, hold the M16A1 in the rest with your right shoulder firmly against the weapon's butt plate.

NOTE: The weapon must be held in the exact position in which it was held when it was sighted in.

6. By using additional stakes or a horizontal board or log you can lay the weapon for grazing fire along more than one line or to cover an entire sector depending on the terrain (figure 1 and 2). Grazing fire is achieved when the cone of fire does not rise 1 meter above the ground.

REFERENCE:

TEC Lesson 930-071-0089-A, Field Expedient Devices, M16 and M203

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TASK NUMBER: 071-311-2101

PERFORM OPERATOR MAINTENANCE ON M203 GRENADE LAUNCHER AND AMMUNITION

CONDITIONS:

Given an M203 grenade launcher; rifle bore cleaner; drycleaning solvent (not containing acid); LSA lubricant or weapons lubricating oil M11-L-141078 (whichever is appropriate); bore brush; clean, dry rags; and an unspecified number of practice or live rounds of ammunition.

STANDARDS:

Within 20 minutes, inspect, clean, and lubricate launcher and inspect and clean the ammunition IAW performance measures, so that upon inspection:

1. Launcher is properly assembled and free of all foreign matter.

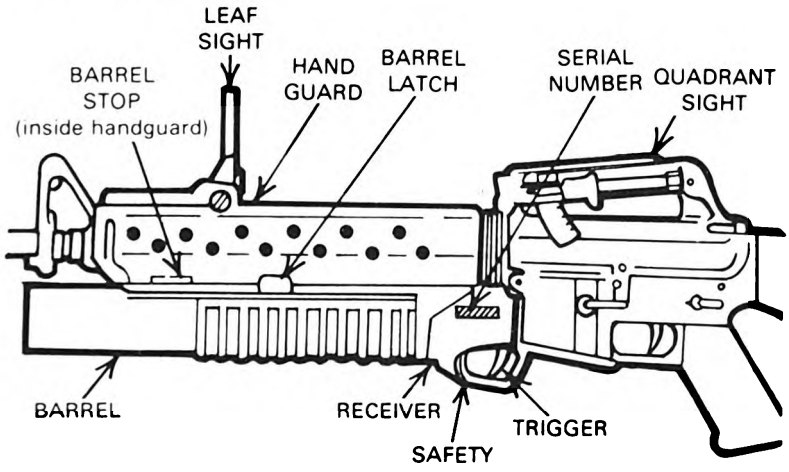
2. Launcher has a heavy coat of oil on working parts, and a light coat of oil elsewhere.

3. Launcher passes functions check.

4. Launcher rounds which are unserviceable (IAW TM 9-1310-202-12, chap 2, page 2-1, para 1b(4)) have been turned in.

PERFORMANCE MEASURES:

1. **Where it's all at . . .**



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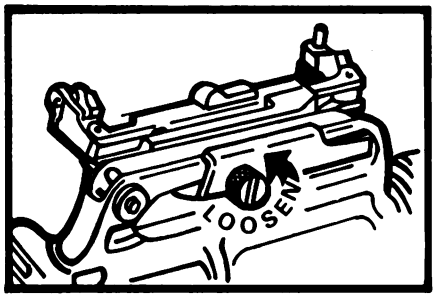
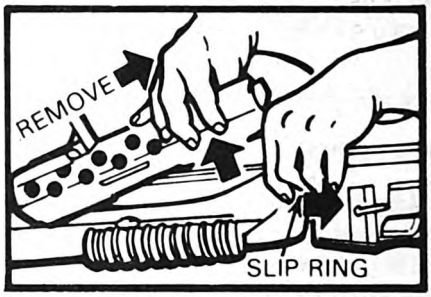
2. **Field strip**

To pass inspection, your grenade launcher must be spotless.

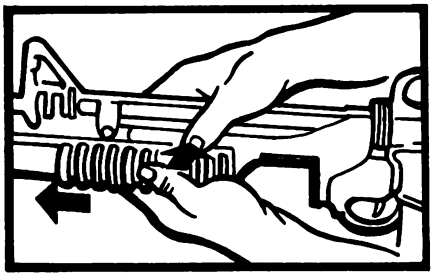
WARNING: Be sure weapon is NOT loaded.



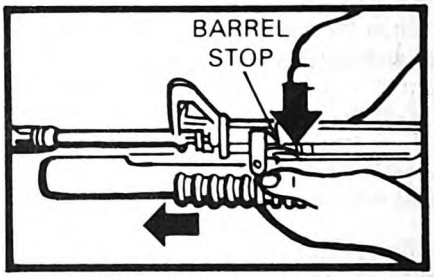
a. THE QUADRANT SIGHT (IF USED) IS REMOVED BY LOOSENING THE KNURLED SCREW ON THE RIGHT SIDE.



PULL BACK SLIP RING. LIFT UP ON HANDGUARD AND PULL TO REAR TO REMOVE.



c. PRESS BARREL LATCH AND MOVE BARREL FORWARD TO STOP.



d. PRESS BARREL STOP TO RELEASE BARREL FROM RECEIVER AND REMOVE.

NO UNAUTHORIZED DISASSEMBLY ALLOWED!!!

Your armorer is the man to see for further disassembly. Save yourself a headache and "statement of charges".

3. **Cleaning Materials, Lubricants, and Care of the Launcher.**

a. Cleaning materials.

(1) Rifle bore clearner (RBC) is used to clean the bore of the launcher and provides temporary protection from corrosion.

(2) Any drycleaning solvent that does not contain acid can be used for cleaning the launcher of dirt, grease, oil, and corrosion preventives.

b. Lubricants.

(1) Military lubricant MIL-L-46000A Lubricating Oil, semi-fluid automatic weapn (LSA) is used for lubricating the launcher at temperatures of above -35° Fahrenheit.

(2) Lubricating oil, arctic weather MIL-L-141078 (LAW) is used at temperatures below 0° F.

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c. Cleaning the launcher and ammunition.

(1) Bore. Attach a clean, dry rag to the thong and thoroughly moisten the rag with bore cleaner. After pulling the rag through several times, attach the bore brush to the thong and pull it through the bore several times. Repeat, using dry rags, inspecting the rag each time. Finally, pull a lightly oiled (LSA) rag through the bore to leave a light coat of oil inside the barrel. When cleaning the bore, the bore brush and rags should be pulled from the breech end to the muzzle end.

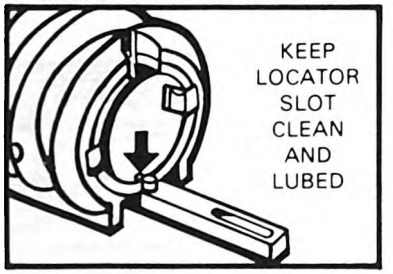
(2) Breech insert. Clean the face of the breech insert retainer with a patch and bore cleaner. Remove the bore cleaner with dry rags, and then oil the face of the breech lightly.

(3) All other parts. Use a brush and dry rag to clean all other parts and surfaces. Apply a light coat of LSA to the exterior of the launcher after cleaning. For cleaning the rifle portion of the launcher, refer to Task: **Perform Operator Maintenance on an M16A1 Rifle, Magazines, and Ammunition.**

(4) Ammunition. Wipe any dirt or grime from ammunition with a dry cloth. If ammunition is corroded, turn it in to the ammunition point. Do not oil ammunition.

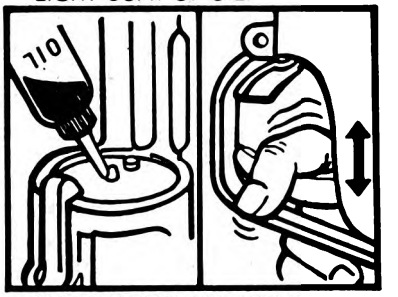
4. **Caring for your launcher is simply good insurance.** A little preventive maintenance on your part will prevent malfunction.

a. CLEAN ALL THE DUST AND CRUD FROM THE WEAPON.

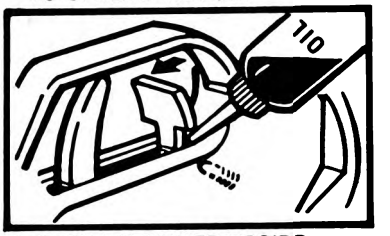


DON'T FORGET: KEEP THE WEAPON CLEAN AND LUBED, EVEN WHEN IT WILL BE UNUSED FOR A PERIOD OF TIME.

b. LUBE BARREL TRACKS AND ALL METAL SURFACES WITH A LIGHT COAT OF OIL.



c. WITH BARREL ON, APPLY A FEW DROPS OF OIL THRU FIRING PIN HOLE. KEEP WEAPON POINTED UP 10-15 SECONDS. CYCLE WEAPON AND PULL TRIGGER TO SPREAD THE OIL.



d. TURN LAUNCHER UPSIDE DOWN AND LUBE THE SAFETY DETENT. IT'S IN THE RECEIVER IN FRONT OF THE SAFETY.

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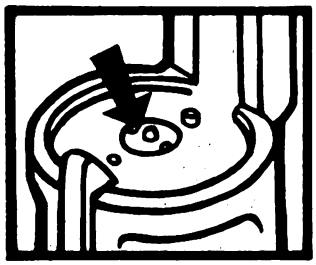
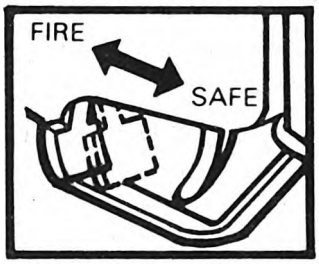
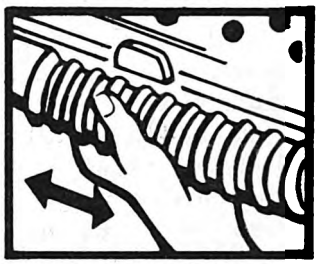
e. INSPECT BORE FOR DIRT, WATER, OIL, AND FOREIGN MATTER.



CHECK FOR LOOSE BREECH INSERT.



CHECK "SAFE" AND "FIRE" POSITIONS.

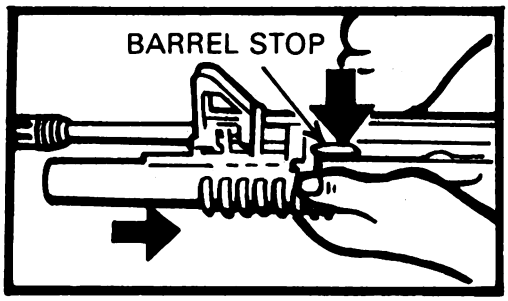


CHECK BARREL STOP AND LATCH.

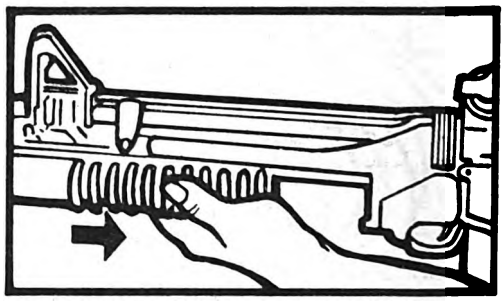
5. **Inspection: While cleaning your M203, you should also inspect for serviceability of parts.** If you find a part which you think is unserviceable, take it to your armorer; he will make the final determination on serviceability and replace parts where necessary. If you do not know what to look for insofar as serviceability is concerned, see the TEC lessons listed at the end of this task.

6. **Assembly procedure for the grenade launcher merely reverses disassembly steps.** For disassembly and assembly of the M16A1 rifle portion of the weapon, refer to Task: **Perform Operator Maintenance on an M16A1 Rifle, Magazines, and Ammunition.**

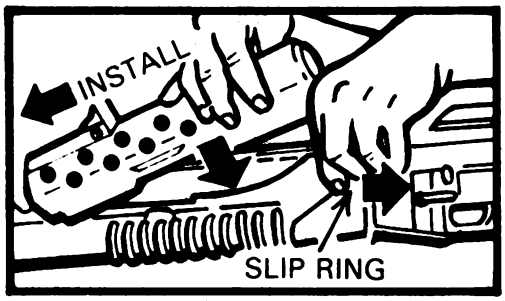
7. **Putting it all together.**



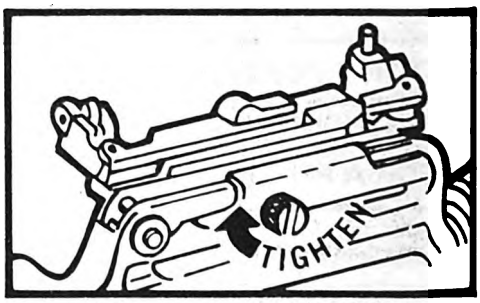
a. PRESS BARREL STOP. SLIDE BARREL ONTO RECEIVER.



b. MOVE BARREL REARWARD TO CLOSE.



c. INSTALL HANDGUARD AND SECURE WITH SLIP RING.



d. INSTALL QUADRANT SIGHT.

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8. **Functional check**

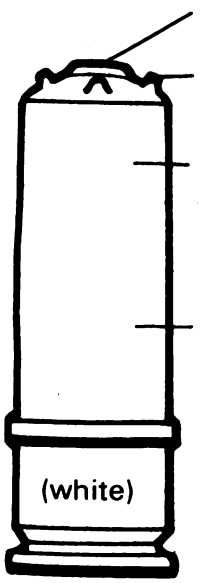
Now that you have it back together, check to make sure everything functions properly.

- CHECK PROPER OPERATION OF SEARS. COCK LAUNCHER AND PULL THE TRIGGER. FIRING PIN SHOULD RELEASE. HOLD TRIGGER TO REAR, COCK LAUNCHER. RELEASE TRIGGER, THEN PULL. FIRING PIN SHOULD RELEASE.

WARNING: THE LAUNCHER COULD FIRE WITHOUT PULLING THE TRIGGER IF THE SEARS DO NOT FUNCTION PROPERLY.

- CHECK SAFETY IN BOTH "SAFE" AND "FIRE" POSITIONS WITH TRIGGER. LAUNCHER MUST BE COCKED BEFORE SAFETY CAN BE PLACED IN "SAFE" POSITION.
- CHECK LEAF SIGHT WINDAGE ADJUSTMENT SCREW FOR PROPER OPERATION. DO NOT MOVE ELEVATION ADJUSTMENT SCREW, IF THE WEAPON HAS BEEN ZEROED.
- MOVE BARREL FORWARD AND BACK TO BE SURE STOP AND BARREL LATCH FUNCTION.

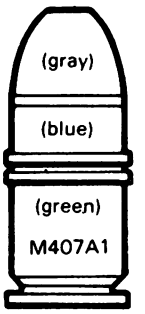
9. **40-mm ammo pyrotechnic signal and spotting round**



ALUMINUM CASES ARE EASILY DENTED AND MAY BE HARD TO CHAMBER AND EXTRACT. BE CAREFUL!

KEEP AMMO DRY, CLEAN AND FREE OF GREASE, SAND, MUD, SNOW & ICE.

TRAINING PRACTICE ROUND



NOTE: None of these rounds contain a mechanical type fuze.

WARNING: The danger radius of practice grenades is 20 meters. DO NOT destroy ammo by mechanical means. The practice round M407A1 Fuze arms between 14 to 28 meters (45 to 93 ft.)

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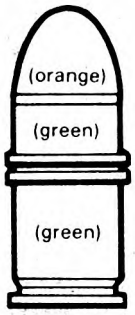
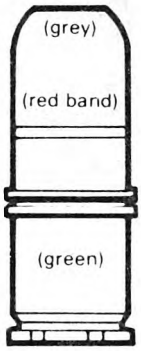
10. **40-mm ammo high explosive (HE) service**



Dual Purpose
M433



Tactical CS,
M651

WARNING: The danger radius of the HE grenades is 130 meters. The M433 round arms within 14 to 28 meters. The M651 arms within 10 to 30 meters and has a burn time of 32 seconds.

REFERENCES:

FM 23-31, 40-mm Grenade Launcher, M203 and M79, May 72 (chap 3, sec I, page 3-1)
TM 9-1010-221-10, Operator's Manual 40-mm Grenade Launcher, M203, Jul 74 (pages 4-8, 15, 16)
TM 9-1310-202-12, Operator and Organizational Maintenance Manual: Cartridges 40-mm, M386, M441, and M397, Oct 69 (chap 2, page 2-1, para 1b(4))
TEC Lesson 940-071-0086-F, M203 Grenade Launcher: Disassembly, Assembly and Maintenance
TEC Lesson 940-071-0088-F, M203 Grenade Launcher: Zeroing and Target Engagement

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TASK NUMBER: 071-311-2102

LOAD, UNLOAD, AND CLEAR THE M203 GRENADE LAUNCHER

CONDITIONS:

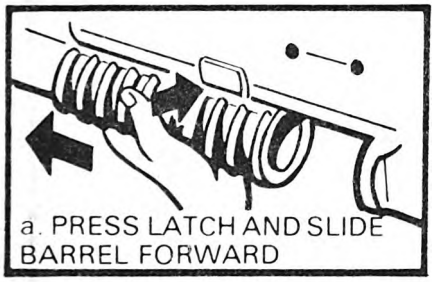
Given an M203 grenade laucher and one round of 40-mm ammunition (Live or Practice).

STANDARDS:

Load, unload, and clear the M203 IAW the performance measures below:

PERFORMANCE MEASURES:

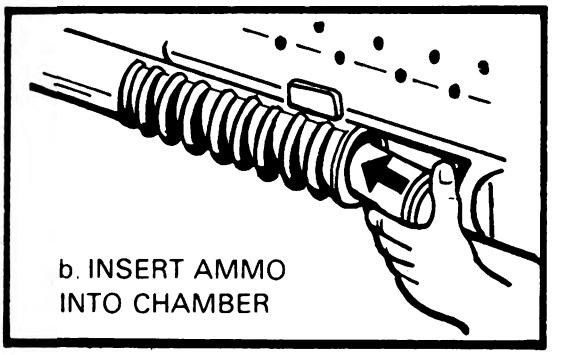
1. Loading



a. PRESS LATCH AND SLIDE BARREL FORWARD

WARNING: Keep muzzle down range and clear of all troops.

CAUTION: Prior to loading, wipe bore and chamber clean and dry with a clean cloth.



b. INSERT AMMO INTO CHAMBER

WARNING: Make sure you have the right ammo. Never load aircraft ammo M384 (HE) or M385 (Practice) . . . . you may blow your head off.

Is ammo dry, clean and undented?

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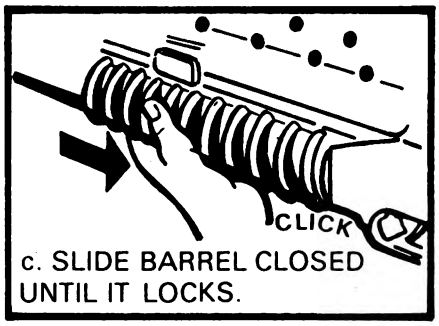
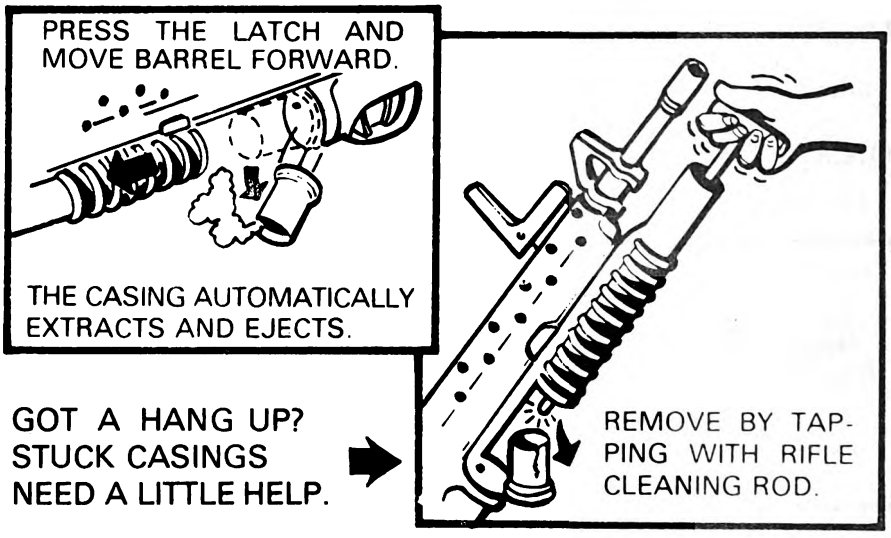


2. Unloading


PRESS THE LATCH AND MOVE BARREL FORWARD.
THE CASING AUTOMATICALLY EXTRACTS AND EJECTS.
GOT A HANG UP? STUCK CASINGS NEED A LITTLE HELP.
REMOVE BY TAPPING WITH RIFLE CLEANING ROD.

3. Clear the Weapon:

a. Depress barrel latch and slide barrel forward.

b. Keeping the weapon pointed down range, look into the barrel to insure there is no round or cartridge case in the barrel.

c. Slide barrel rearward, locking it to the breech.

REFERENCES:

FM 23-31, 40-mm Grenade Launchers, M203 and M79, May 72 (chap 3, sec II, page 3-2)

TM 9-1010-221-10, Operator's Manual 40-mm Grenade Launcher M203, Jul 74 (pages 20, 21, and 26)

TEC Lesson 940-071-0086-F, M203 Grenade Launcher: Disassembly, Assembly and Maintenance

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TASK NUMBER: 071-311-2103

ZERO AN M203 GRENADE LAUNCHER

CONDITIONS:

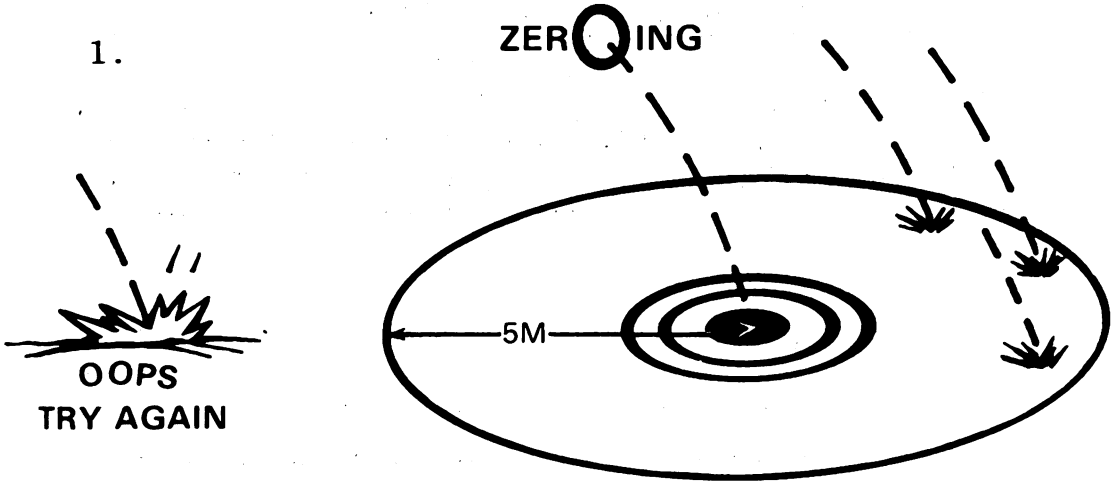
Given an unzeroed M203 grenade launcher, five rounds of HE or TP ammunition (for each type sight), and a firing range.

STANDARDS:

Gunner will obtain an elevation and windage sight setting (on both leaf and quadrant sights) which will enable him to hit within 5 meters of his point of aim at a distance of 200 meters with two consecutive rounds.

PERFORMANCE MEASURES:

1.



WARNING: DO NOT ZERO IN UNDER 100 METERS.

Select a target at 200 meters and fire a round. If the round does not fall within 5 meters of target, ZEROING PROCEDURES ARE CALLED FOR AND SIGHT ADJUSTMENTS MUST BE MADE FOR MORE OR LESS ELEVATION. Windage adjustments must be made for each firing. After each round fired make necessary adjustments until 2 consecutive rounds land within 5 meters of aiming point.

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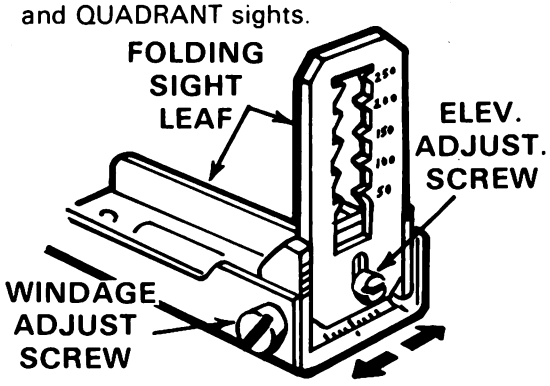
The point is to hit what you are aiming at. So, let's get familiar with the LEAF and QUADRANT sights.



WARNING: The 50-meter mark on the leaf sight blade is marked in red to emphasize that this range is not to be used in zeroing procedures.

The LEAF SIGHT is used in conjunction with front sight post of the M16A1 rifle and provides range selection from 50 to 250 meters in 50-meter increments.

2. **Leaf sight zeroing:**

a. Select a target at 200 meters.

b. Place the sight leaf in upright position.

c. Place the center mark of the windage scale on the index line at the rear of the sight base.

d. Loosen the elevation adjustment screw on the leaf sight and place the index line of the leaf sight on the center elevation mark on the sight mount.

e. Tighten elevation adjustment screw on the sight leaf.

f. Take a supported prone position.

g. Aline target with the 200-meter increment of the leaf sight and the front sight post of the rifle.

h. Fire a round, observe the impact, and make necessary sight adjustment.

(1) Turning the sight windage screw clockwise moves the strike of the round to the left; turning the windage screw counterclockwise moves the strike to the right. One increment in either direction equals 1½ meters at a range of 200 meters.

(2) Raising the leaf sight increases range; lowering it decreases range. One increment equals 10 meters at a range of 200 meters.

i. Fire one or more rounds and make necessary adjustments after each round until a round has landed within 5 meters of the target.

j. Fire a confirming round.

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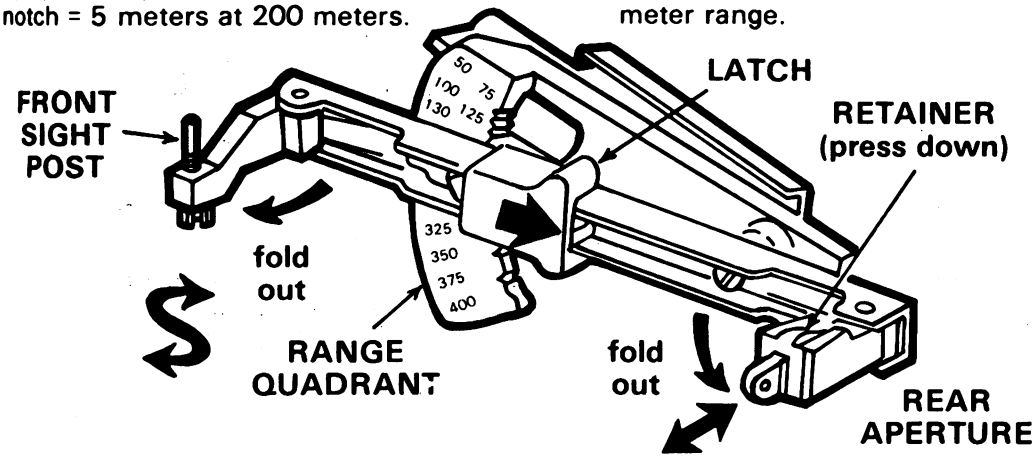
The QUADRANT SIGHT attaches to rifle handle/sight and has range from 50 to 400 meters in 25 meter increments. Elevation adjustment: 1 notch = 5 meters at 200 meters.

The rear aperture slides in or out for windage correction by depressing retainer. Vertical line denotes center. One notch equals 1.5 meters at 200-meter range.



Turn front sight post right for less elevation and left for more elevation.

Slide in to move strike of projectile right; Slide out to move strike left.

3. **Quadrant sight zeroing.**

a. Select a target at 200 meters.

b. Insure that the sight is correctly mounted on the carrying handle of the rifle.

c. Move the front sight post and rear sight aperture from the closed to the open position.

(1) Depress the rear sight retainer and slide the rear sight aperture to the left or right until the wide index line of the rear sight aperture is alined with the edge of the sight aperture arm.

(2) Move the front sight post to its highest position and then back off 2½ turns.

d. Move the sight latch rearward and reposition quadrant sight arm to zeroing range (200 meters).

e. Take a supported prone position.

f. Aline target with the front and rear sights, using correct sighting and aiming procedures.

g. Fire a round, observe the impact, and make necessary sight adjustment.

(1) For range adjustment, turn front sight post clockwise to decrease range and counterclockwise to increase range. One full turn equals 5 meters at a range of 200 meters.

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(2) For windage adjustment, press sight aperture retainer and move rear sight aperture away from barrel to move trajectory of the projectile to the left. Move the rear sight aperture toward barrel to move trajectory to the right. One notch on the rear sight aperture equals 1½ meters at a range of 200 meters.

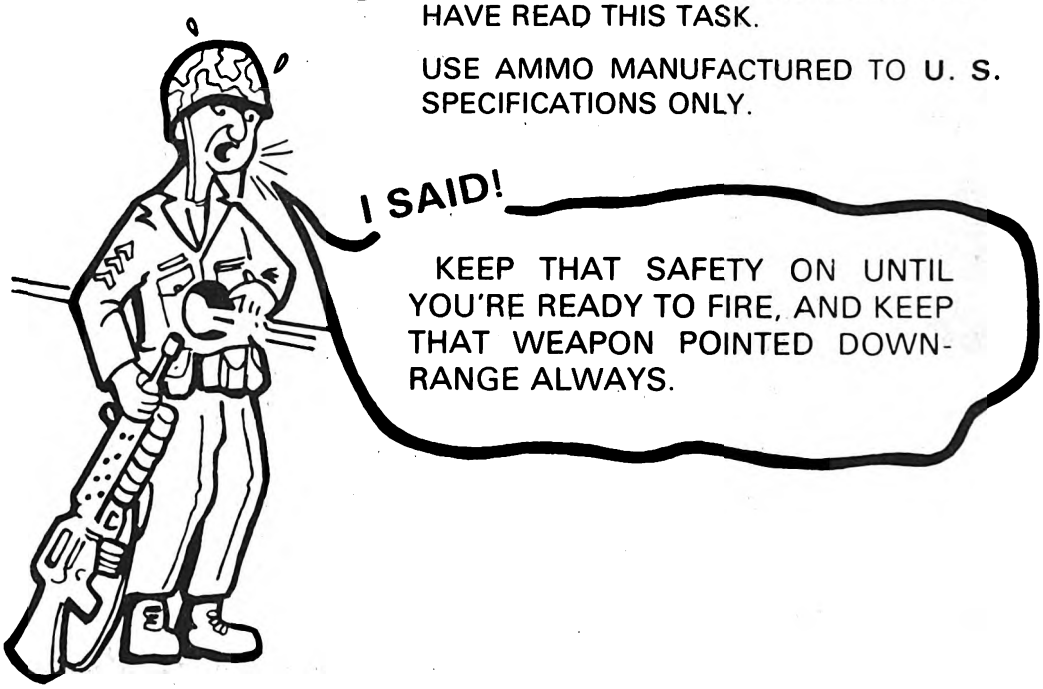
h. Fire one or more cartridges and make necessary adjustments after each round. When a round has landed within 5 meters of the target, the weapon is zeroed.

i. Fire a confirming round.

NOTE: If the individual has not zeroed after firing five rounds, his weapon will be inspected to insure that it is assembled and functioning properly. After the weapon is checked the individual may be given another opportunity to zero.

WARNING: DO NOT FIRE THIS LAUNCHER UNTIL YOU HAVE READ THIS TASK.

USE AMMO MANUFACTURED TO U. S. SPECIFICATIONS ONLY.



REFERENCES:

FM 23-31, 40-mm Grenade Launcher, M203 and M79, May 72 (chap 6, pages 6-12, 6-13, para 6-18 -- 6-21)
TM 9-1010-221-10, Operator's Manual 40-mm Grenade Launcher M203, Jul 74 (pages 16-19; 24)
TEC Lesson 940-071-0088-F, The M203 Grenade Launcher: Zeroing and Target Engagement

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TASK NUMBER: 071-311-2104

ENGAGE TARGETS WITH AN M203 GRENADE LAUNCHER AND APPLY IMMEDIATE ACTION TO REDUCE A STOPPAGE

CONDITIONS:

On a live fire range, given 7 practice rounds, 1 unmarked dummy round, an M203 grenade launcher, instructions to load and engage 4 targets until all ammunition is expended, and targets consisting of:

POSITION		TARGET	RANGE
Kneeling	Supported	Window (.75m wide x 1m high)	90-100 m
		Bunker (1m high x 1.5m wide)	105-115 m
Foxhole or Bunker	Supported	Troops in an Open Emplacement	275-300 m
		Troops in the Open	325-350 m

STANDARDS:

Within 6 minutes, hit 3 of the 4 targets, applying immediate action to reduce any stoppage. A hit consists of:

1. Placing a round through the window.
2. Hitting the front of the bunker.
3. Hitting within 5 meters of troops in an open emplacement.
4. Hitting within 5 meters of troops in the open.

PERFORMANCE MEASURES:

1. Sighting consists of sight alinement and getting a sight picture (figure 1).

2. Aiming.

a. The firer obtains a correct sight alinement and then shifts his focus to the target for a correct sight picture. As the trigger is pressed, he continues shifting eye focus.

b. Firer should use controlled breathing just as he would when firing the rifle.

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3. Pointing technique. To use the pointing technique, bring the weapon to a modified underarm firing position. With both eyes open, concentrate your vision on the target, keeping the flash suppressor of the rifle in the lower part of your field of view. Point the flash suppressor of the rifle at the target and sense the elevation of the weapon with respect to the range to the target. To make corrections in elevation and deflection, sense the impact of the round and make appropriate changes in the position of the weapon.

4. Sensing.

a. Sensing is an instantaneous determination by the grenadier as to where the grenade explodes with respect to the target. Sensings are made in both range and deviation to the nearest 5 meters since the casualty radius of the HE round is 5 meters.

b. Range sensings are made as follows:

(1) Short -- If the grenade bursts between the grenadier and target.

(2) Over -- If the burst is over the target.

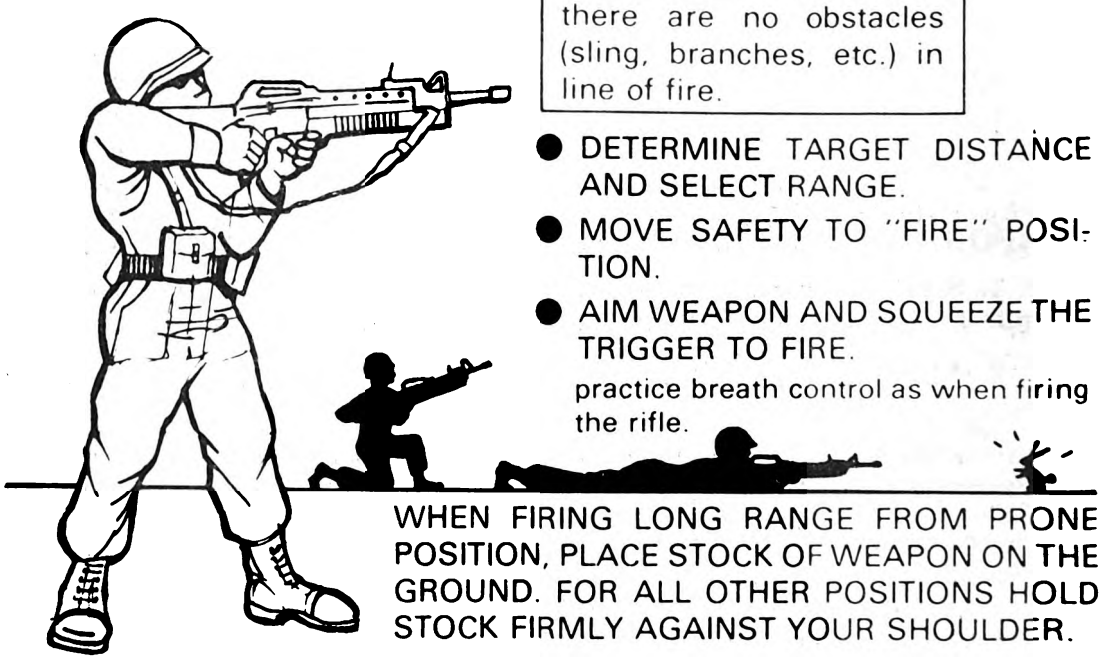
(3) Target -- Grenade hits any portion of target.

(4) Range Correct – The grenade is slightly left or right of the target, but at correct range.

(5) Doubtful -- If the grenade is at range correct but grenadier cannot make a positive sensing.

c. Deviation sensings are RIGHT, LEFT, or LINE.

5. Firing.


WARNING: Make certain there are no obstacles (sling, branches, etc.) in line of fire.
● DETERMINE TARGET DISTANCE AND SELECT RANGE.
● MOVE SAFETY TO "FIRE" POSITION.
● AIM WEAPON AND SQUEEZE THE TRIGGER TO FIRE.
practice breath control as when firing the rifle.
WHEN FIRING LONG RANGE FROM PRONE POSITION, PLACE STOCK OF WEAPON ON THE GROUND. FOR ALL OTHER POSITIONS HOLD STOCK FIRMLY AGAINST YOUR SHOULDER.

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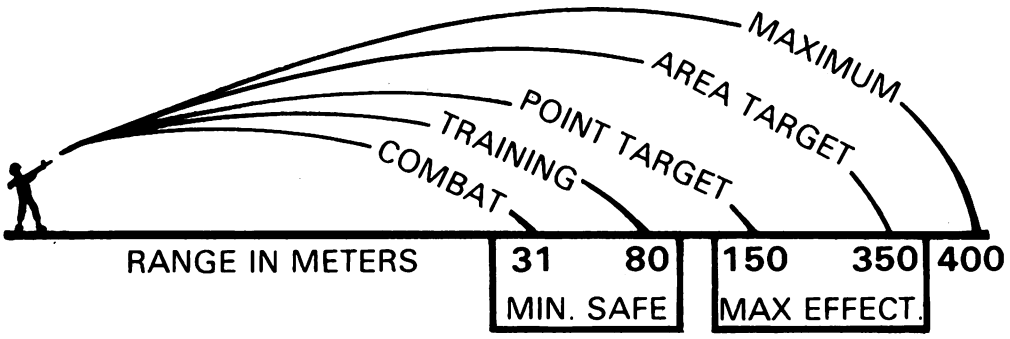
6. Adjustment of fire.

a. Adjustment of fire is the action taken by the grenadier using sensing, sight manipulation, and an adjusted aiming point to insure a second round hit.

b. When using the sight leaf, the grenadier simply changes his sight alinement or uses an adjusted aiming point.

c. If the first grenade impacts more than 25 meters over or short of the target, adjust the range quadrant to bring the next grenade on target.

7. Range determination (see Task: Estimate Range). Successful target engagement depends upon your ability to determine range. Ranges at which a 50% probability of target hit can be expected are shown below:



POINT TARGETS:
- BUNKER OPENING 50m
- WINDOW OPENING 125m
- VEHICLE/WEAPONS EMPLACEMENT 200m

AREA TARGETS (FIRE TEAM SIZE) 350m

WARNING: WHEN YOU FIRE HIGH EXPLOSIVE (HE) GRENADES AT TARGETS WITHIN 80 METERS (265 FT.), BE IN A PROTECTIVE POSITION. TARGETS IN A TRAINING SITUATION SHOULD NOT BE ENGAGED WITHIN 80 METERS. TARGETS IN A COMBAT SITUATION NO CLOSER THAN 31 METERS.

8. Failure to fire. After a failure to fire due to the possiblity of a misfire or hangfire, the following precautions must be observed until the round has been removed from the weapon and cause of failure determined (see figure 2):

a. Shout "MISFIRE", keeping the weapon trained on the target, and keeping all troops clear of the muzzle.

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WARNING: In training situations, before attempting to remove the round from the grenade launcher, men not required for the operation should be cleared from the area.

b. Wait 30 seconds from the time of failure to fire before opening the breech for unloading procedures.

c. Exercise extreme caution during unloading procedures; where circumstances permit, either catch the ejected round or reduce the distance it falls by holding the weapon close to the ground.

d. After the round has been removed from the receiver, determine whether the round or the firing mechanism is defective. Examine the primer to see if it has been dented. If the primer has not been dented, the firing mechanism is at fault. The round may be reloaded and fired after the cause of failure to fire has been corrected.

e. If the primer has been dented, keep the round separate from other ammunition until it can be properly disposed of.

f. Shouting "MISFIRE" should apply only to training situations.

HANGFIRE: IS A DELAY IN THE PROPELLANT CHARGE IGNITING.

MISFIRE: IS A FAILURE TO FIRE AND WILL BE HANDLED SAME AS A HANGFIRE.

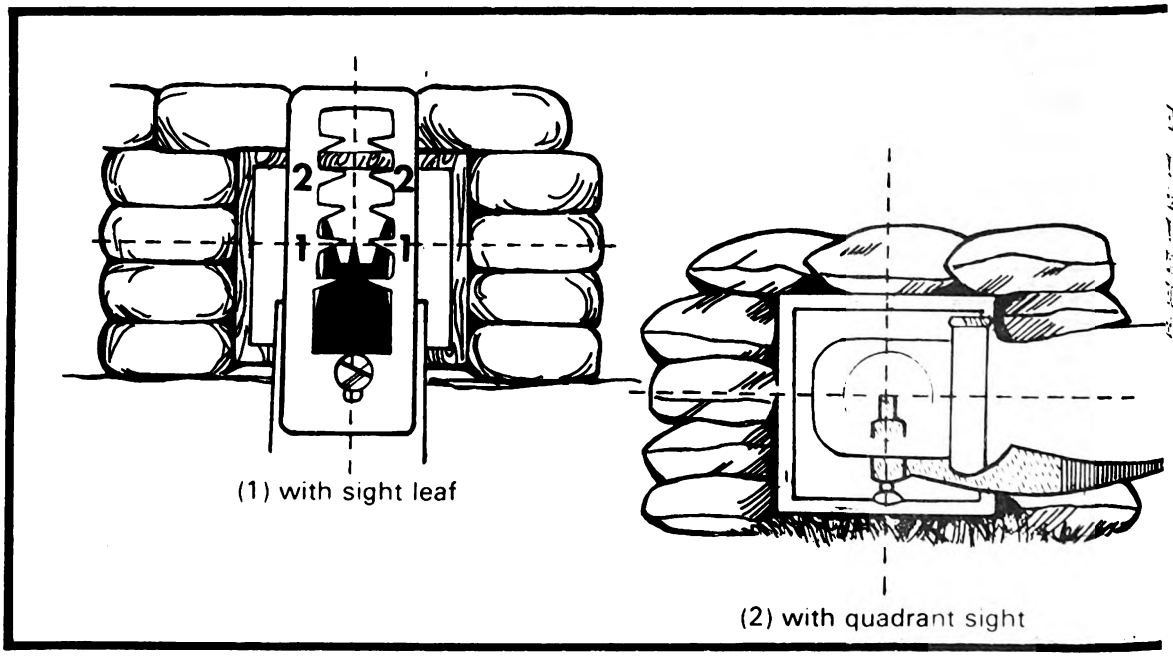

Figure 1. Correct sight alinement.

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Malfunction	Probable Cause	Corrective Action
Failure to fire	Safety on	Place in fire position.
	Empty chamber	Load weapon.
	Faulty ammunition	Reload.
	Water or excess lubricant in firing pin well	Hand cycle weapon several times to include pulling the trigger.
	Worn or broken firing pin	Replace.*
	Dirt or residue in firing pin recess	Clean.
	Burned sear on firing pin	Replace.*
	Dirty firing pin well opening	Clean firing pin well opening.*
	Weak or broken firing pin spring	Replace.*
Failure to cock	Broken sear	Replace.*
	Improper assembly of cocking lever	Reassemble.*
	Loose, broken, or missing cocking lever spring pin	Replace.*
Failure to lock	Excess plastic on breech end of barel assembly	Trim excess plastic until barrel assembly will lock.*
	Dirty follower assembly or receiver cavity	Clean.
Failure to chamber	Faulty ammunition	Reload.
	Dirty chamber	Clean bore and chamber.
Failure to extract	Defective extractor on spring or spring pin	Replace.*
	Ruptured cartridge case	Remove from barrel.
Failure to eject	Worn, broken, or missing ejector spring or retainer	Replace.*
Safety fails to stay in position	Broken or worn safety or missing spring pin	Replace.*
Sight will not stay in selected position	Sight mounting machine screw loose	Tighten screw or replace if dented or broken.

*Procedures to be accomplished by DS/GS Maintenance.

Figure 2.

REFERENCES:

FM 23-31, 40-mm Grenade Launcher, M203 and M79, May 1972 (chap 6, sec II, page 6-1)
TM 9-1010-221-10, Operator's Manual 40-mm Grenade Launcher M203, 31 July 1974 (pages 17, 22, and 25)
TEC Lesson 940-071-0088-F, M203 Grenade Launcher: Zeroing and Target Engagement

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TASK NUMBER: 071-311-2105

USE LIMITED VISIBILITY FIRING TECHNIQUE WITH THE M203 GRENADE LAUNCHER

CONDITIONS:

You are a grenadier in a field location with good visibility. The squad leader has assigned your position and has pointed out the left and right limits of your sector of fire. Given 3 training practice rounds and 5 to 15 stakes for use as aiming or firing stakes.

STANDARDS:

During daylight, construct and place out aiming and firing stakes that will cause rounds to hit targets during periods of limited visibility.

PERFORMANCE MEASURES:

1. Locate possible targets within your sector of fire — deadspace, likely avenues of enemy approach, likely enemy assault positions.

2. Estimate the range to the located targets by one of the following methods:

a. Pacing. See Task: **Determine Distance While Moving Between Two Points on the Ground.**

b. Map distance. See Task: **Measure Distance on a Map.**

c. Naked eye. See Task: **Estimate Range.**

3. Place the range that you estimate to the target(s) on the quadrant sight.

4. Place the launcher on the ground with the muzzle pointing at the target, and the buttplate at your position.

5. Scoop out a small amount of earth, creating a small hole, where the buttplate touches the ground.

6. Place the toe of the buttplate into the hole.

7. Get into your fighting position, raise the muzzle of the launcher, look through the quadrant sight, and adjust the elevation of the muzzle until you get the correct sight picture.

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8. Drive a stake into the hole behind the buttplate. This stake acts as the recoil stake.

9. Drive two stakes into the ground to hold the launcher at the correct elevation angle . . . one stake under the barrel assembly and the other under the small of the stock.

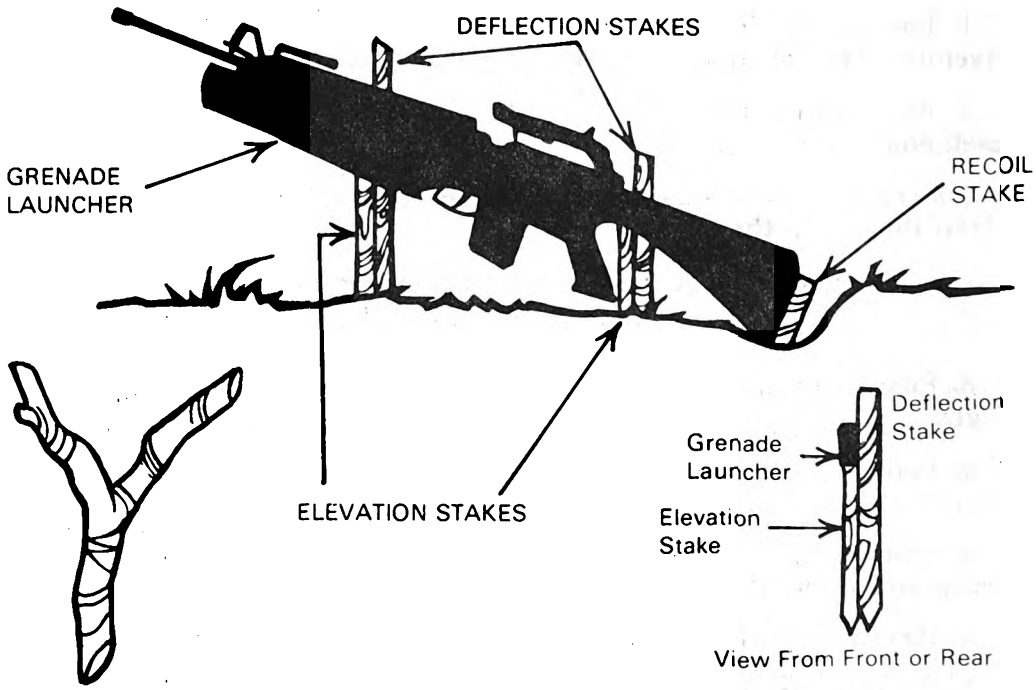
10. Drive two longer stakes into the ground to hold the launcher at the correct deflection angle . . . one stake alongside the elevation stake near the barrel assembly, and the other alongside the elevation stake at the small of the stock.

NOTE: The deflection stakes should extend no more than an inch or two above the barrel assembly/small of the stock.

11. Look through the quadrant sights on the launcher and, if necessary, move the stakes until you get the correct sight picture.

12. Fire a grenade to test the positioning of the weapon. If necessary, change the positioning of the weapon. (If tactical situation permits.)

13. Repeat steps 1 through 12 if more than one firing position is required.



NOTE: A forked stick can serve as both an elevation and deflection stake.

REFERENCES:

None

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TASK NUMBER: 071-318-2201

PREPARE AN M72A2 LAW FOR FIRING; RESTORE M72A2 LAW TO CARRYING CONFIGURATION

CONDITIONS:

Given an M72A2 LAW (NOTE: Expended LAW may be used).

STANDARDS:

1. Preparation for firing:

a. Within 30 seconds, conduct a visual prefiring safety inspection. Do not extend/fire damaged LAW.

b. Within 30 seconds, extend the launcher and lock in position, check backblast area, place launcher on the shoulder in firing position, and move the safety handle to ARM.

2. Restore to carrying configuration: Place on SAFE with the launcher tube collapsed, sights in down position, and sling assembly and pull pin replaced.

PERFORMANCE MEASURES:

1. **To prepare the launcher for firing:**

a. Inspect the M72A2 LAW to insure that all seals are intact and that the tube has not been cracked, punctured, or crushed. Check the pull pin and trigger safety handle to verify proper placement. Damaged LAWs should not be fired.

WARNING: Check data plate on launcher for words "with coupler." If words are not on data plate do not attempt to fire the weapon.

b. See figure 1. Remove the pull pin and rotate the rear cover downward (figure 1A), allowing the front cover and sling assembly to fall free. Do not discard the sling assembly until the rocket is fired.

c. Extend the launcher by grasping the rear sight cover and sharply pulling the launcher to the rear until locked into position (figure 1C). Attempt to collapse the launcher by reversing the motion of your hands to verify it is locked into position.

d. Place the weapon on the shoulder (figure 2A).

e. Check the backblast area (figure 2B). If soldiers are in the backblast

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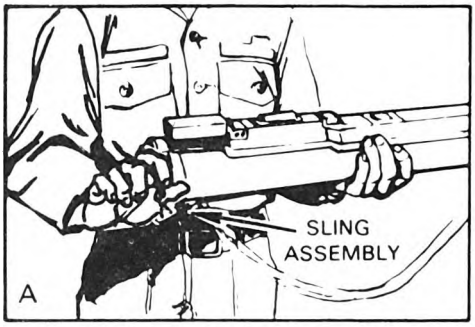
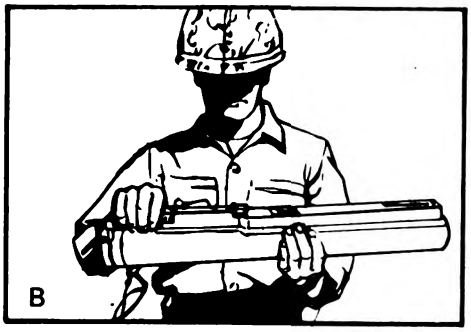
area, warn them and wait for them to get out of the area before arming the launcher.

f. Move the safety handle to ARM (figure 2B) once the backblast area is clear.

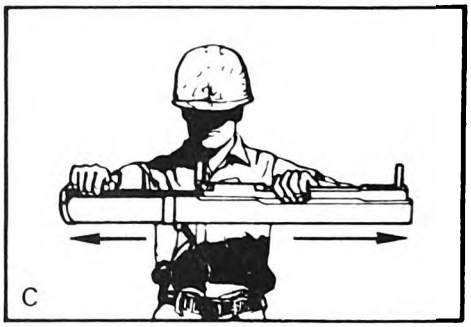
CAUTION: Once the weapon is placed on the shoulder, keep it pointed up and down range.



REMOVAL OF SLING ASSEMBLY

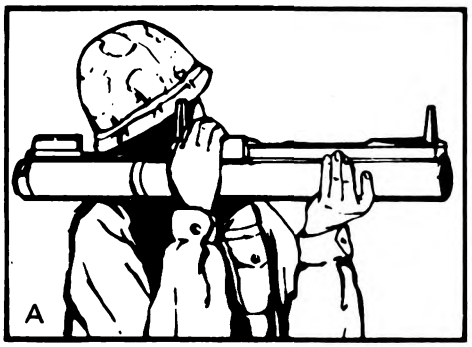


PREPARING TO EXTEND LAUNCHER

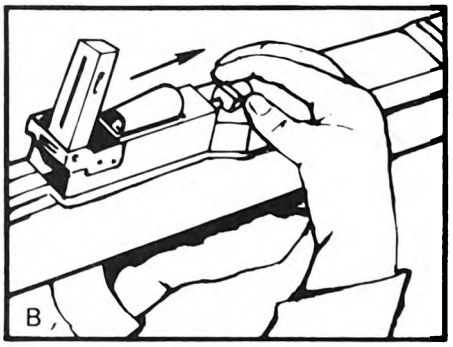


LAUNCHER EXTENDED

Figure 1. Preparation/Extending Launcher.



ARMING THE LAUNCHER
PLACE LAUNCHER ON SHOULDER



MOVING SAFETY TO "ARM" POSITION

Figure 2. Arming the Launcher.

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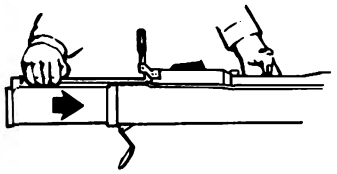
2. **To restore to carrying configuration:**

a. Return trigger safety handle to SAFE.

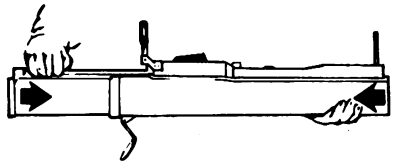
b. Grasp launcher by rear sight housing.

c. Squeeze detent boot.



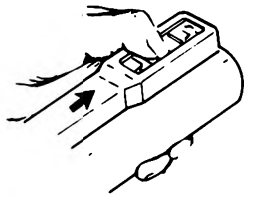
d. Collapse launcher slightly.

e. Move hand from detent boot to front sight.



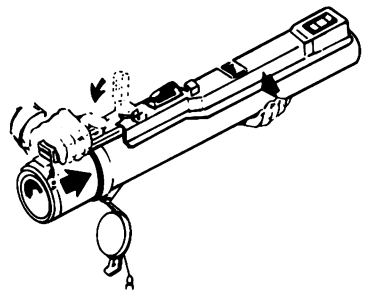
f. Hold down front sight.

g. Collapse launcher until inner tube covers tip of frontsight.



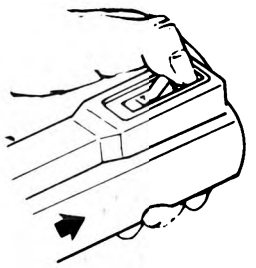
COMPLETE ALL COMPRESSION ACTIONS SLOWLY TO AVOID INJURY TO FINGERS

h. Fold down rear sight and guide under housing.



i. Compress launcher until travel is stopped by lip on front sight.

j. Press front sight lip with thumb and slowly compress launcher over lip edge.



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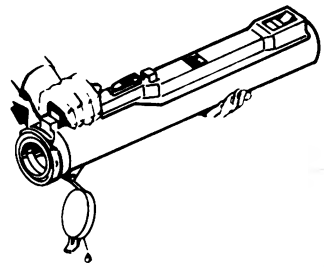
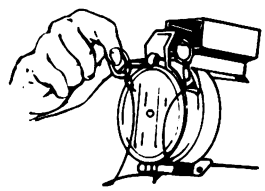
k. Remove thumb from front sight and grasp housing.

l. Close launcher fully.



m. Close rear cover, insuring that the round lock fits through the slot in the cover.

n. Replace cover pull pin. (NOTE: Cover pull pin should be inserted from right to left with the short end through the cover closing lug and the long end through the round lock which protrudes through the rear cover.)



REPLACE COVER
PULL PIN

o. Replace front cover and hold in place.

p. Replace sling assembly. Grasp both web straps of the sling assembly next to the hook springs and place thumb on the rear cover above the hinge. Exert downward pressure with the thumb while pulling up on the sling assembly until the hooks snap into position over the cover hinge. (NOTE: Using the rear cover as a lever to assist in attaching the sling assembly will damage the cover hinge.)

REFERENCES:

FM 23-33, 66-mm HEAT Rocket M72A1, M72A2, and M72, C1 & 2, Jul 70 (chap 4, page 16, para 19)
TEC Lesson 948-071-0005-F, Operating the M72A2 LAW

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TASK NUMBER: 071-318-2202

ENGAGE TARGETS WITH AN M72A2 LAW

CONDITIONS:

During daylight, on a suitable firing range, given an M190 subcaliber device and seven M73 rockets (three rounds for stationary target phase and four rounds for moving target phase), a series of stationary targets located between 75 and 200 meters from firer which will be presented in a combination of frontal, flank, or oblique views, and a moving [6 to 24 kmph (4 to 14 mph)] target presented in a flank view between 75 and 165 meters from the firer.

STANDARDS:

Firer will achieve:

1. Two target hits of three rockets fired at stationary targets.

2. Two target hits of four rockets fired at moving targets.

PERFORMANCE MEASURES:

1. **Sights.**

a. Rear Sight. The rear sight consists of a flip-up peepsight. The sight should be as close to the eye as possible and the front sight viewed through the peep when sighting (aiming).

b. Front Sight (figure 1). The front sight is a clear plastic flip-up leaf. On the sight there is a vertical range line with ranges from 50 to 350 meters indexed in 25-meter increments, two curved stadia lines (LAW stadia lines are not accurate and are no longer used) and lead crosses.

2. **Estimating Range.** The first step in target engagement is to determine the range to the target. This should be done using visual range estimation (see task: Estimate range) aided by the use of a range/sector card. A range/sector card is a rough drawing of the terrain in your defensive sector which shows easily recognized reference points (terrain features or objects) and the distance to each (paced off or measured when possible). If there are no usable reference points available, stakes can be erected at known ranges to serve the same purpose.

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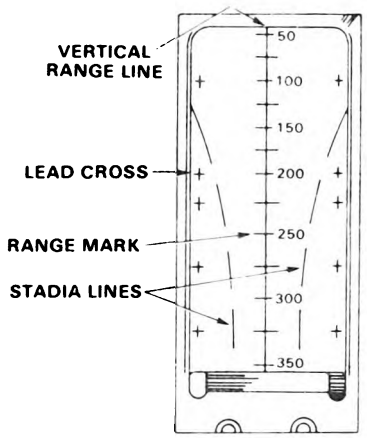


Figure 1. Front sight.

3. **Sighting.**

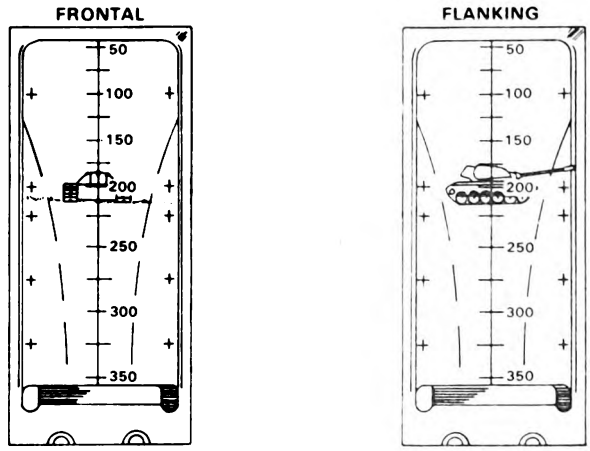
a. Stationary Targets. After determining the range, you sight on stationary targets by:

(1) Locating the range mark on the vertical range line corresponding to the estimated range,

(2) Placing that point on the center of target mass (figure 2), and

(3) Fire.

NOTE: Consider all front/rear views as stationary targets, even if moving.



2a. *2b.*

Figure 2. Stationary targets at an estimated range of 200 meters.

b. Moving Targets, After determining the range, you sight on moving targets by:

(1) Estimating target speed as slow or fast (see table 1).

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ESTIMATE TARGET SPEED AS:

***SLOW** for:*

a. Vehicles moving 5 mph (8 kmph) or less.

b. All oblique targets where you see more of the front/rear than side.

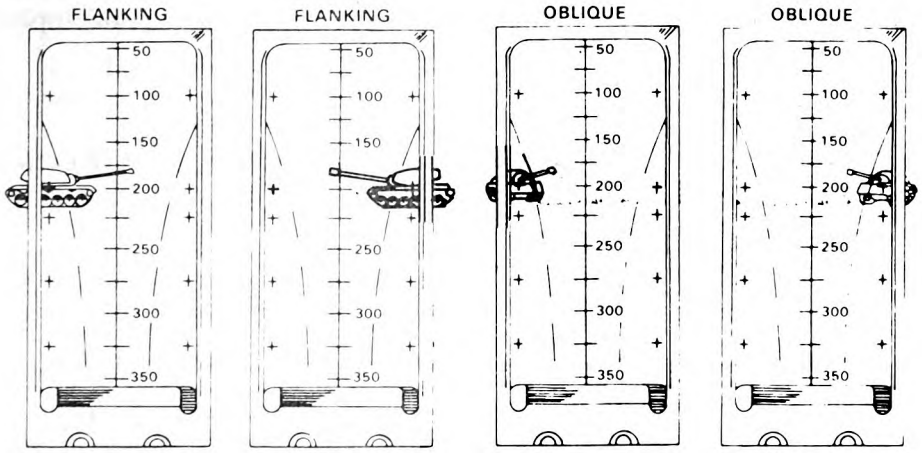
***FAST** for:*

All targets (except b above) traveling faster than 5 mph (8 kmph).

Table 1.

(2) Applying appropriate lead using lead cross directly opposite estimated range, and

(a) For slow targets, lead cross should be on center of mass (figure 3). The vertical range line should be in front of the target.



3a. *3b.*

Figure 3. Slow targets at a range of 200 meters.

(b) For fast targets, lead cross should be on front edge of target (figure 4). The vertical range line should be in front of the target.

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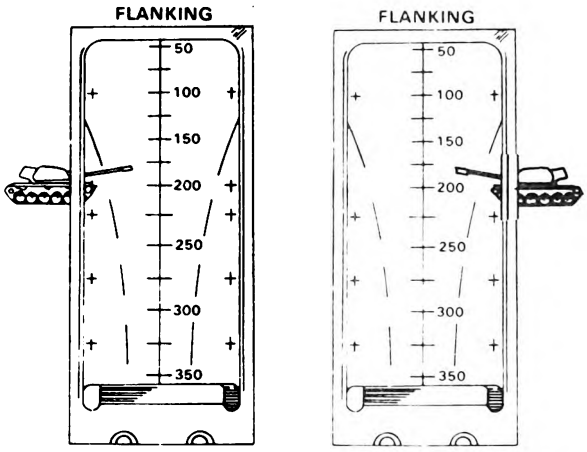

Figure 4. Fast target at a range of 200 meters.

(3) Fire.

NOTE: If there is no lead cross at your estimated range, use an imaginary lead cross which alines with those present on the sight.

4. **Trigger Squeeze.**

The trigger is unique in that it is a bar located on the top of the launcher. To fire, pressure must be applied straight down. The gunner should apply a steady, smooth squeeze downward with fingertips only.

REFERENCE:

FM 23-33, 66-mm Heat Rocket M72A1, M72A1E1, M72 (Revised Edition, TBP)

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TASK NUMBER: 071-318-2203

APPLY IMMEDIATE ACTION TO CORRECT A MALFUNCTION ON AN M72A2 LAW

CONDITIONS:

During daylight or darkness, in a field location, given an M72A2 LAW; an attempt to fire the weapon having resulted in a misfire.

STANDARDS:

Within 3 minutes, apply immediate action and attempt to fire the LAW. If the weapon still fails to fire, dispose of the weapon in accordance with unit SOP.

NOTE: Time factors and safety precautions apply only to training.

PERFORMANCE MEASURES:

1. **Immediate action (training only).**

a. Resqueeze the trigger bar. If round does not fire, shout "MISFIRE," wait 10 seconds.

b. Place trigger safety handle on SAFE while keeping LAW trained on the target, then remove from shoulder.

c. Wait 1 minute, depress detent and collapse launcher about 4 inches.

d. Re-extend launcher and place it on shoulder.

e. Check backblast area.

f. Arm, aim, and attempt to fire.

g. If LAW fails to fire after use of immediate action (training only).

(1) Keep LAW aimed at target for 10 seconds.

(2) Place LAW on SAFE and keep it aimed on target for 1 minute.

(3) DO NOT COLLAPSE LAUNCHER.

(4) Dispose of launcher as directed by unit SOP.

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2. **Immediate action (combat only).**

a. Immediately resqueeze the trigger bar if round does not fire.

b. Return the arming handle to SAFE.

c. Remove LAW from shoulder, collapse and re-extend (keeping hands clear of the front and rear tube openings).

d. Replace the LAW on shoulder.

e. Check the backblast area.

f. Arm, aim, and attempt to fire.

g. If the LAW still fails to fire, return to SAFE, remove from shoulder, collapse the tube (this keeps the firing mechanism from functioning) and discard.

NOTE: DO NOT LEAVE an intact LAW on the battlefield. The enemy can and will use it against you.

h. If another LAW is available, try to engage the target if it is still in range or poses a threat to your unit.

NOTE: If an M190 subcaliber device was used in training, an instructor or safety NCO should examine the primer housing lock pin to insure that the bent position of the lock pin is pushing against the primer housing door. This is to be done after the first 1-minute wait is completed. After the second failure to fire and its subsequent 1-minute wait, remove the M73 and examine the primer cap. If the primer cap is dented, a rocket malfunction has occurred, and if the primer cap is not dented, the launcher has malfunctioned.

REFERENCES:

FM 23-33, 66-mm HEAT Rocket M72A1, M72A2, and M72, Jul 70 (chap 2, pages 10 and 11, para 13)
TEC Lesson 948-071-0005-F, Operating the M72A2 LAW

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TASK NUMBER: 191-376-0105

MAINTAIN A CALIBER .45 PISTOL

CONDITIONS:

Given one caliber .45 pistol; one magazine; cleaning compound, solvent (CR); volatile mineral spirits, paint thinner, or drycleaning solvent; clean rags; and lubricating oil, PL Special.

STANDARDS:

Within 20 minutes, you must clear, disassemble, clean, lubricate, and reassemble the pistol.

PERFORMANCE MEASURES:

1. **Clearing.**

   a. Hold the pistol in the raised pistol position.

   b. Depress the magazine catch and remove the magazine.

   c. Pull the slide to the rear and lock it in its rearward position by pushing up on the slide stop.

   d. Point the pistol toward the sky and look into the chamber to be certain it is clear.

2. **Disassembly** (figure 1).

3. **Care and Cleaning of the Caliber .45 Pistol.**

   a. Cleaning materials.

   (1) Cleaning compound, solvent (CR), is used to clean the bore and face of slide after firing. This cleanser has preservative properties and provides temporary protection against rust.

CAUTION: CR solvent cleaning compound is usable at temperatures of -20°F and higher.

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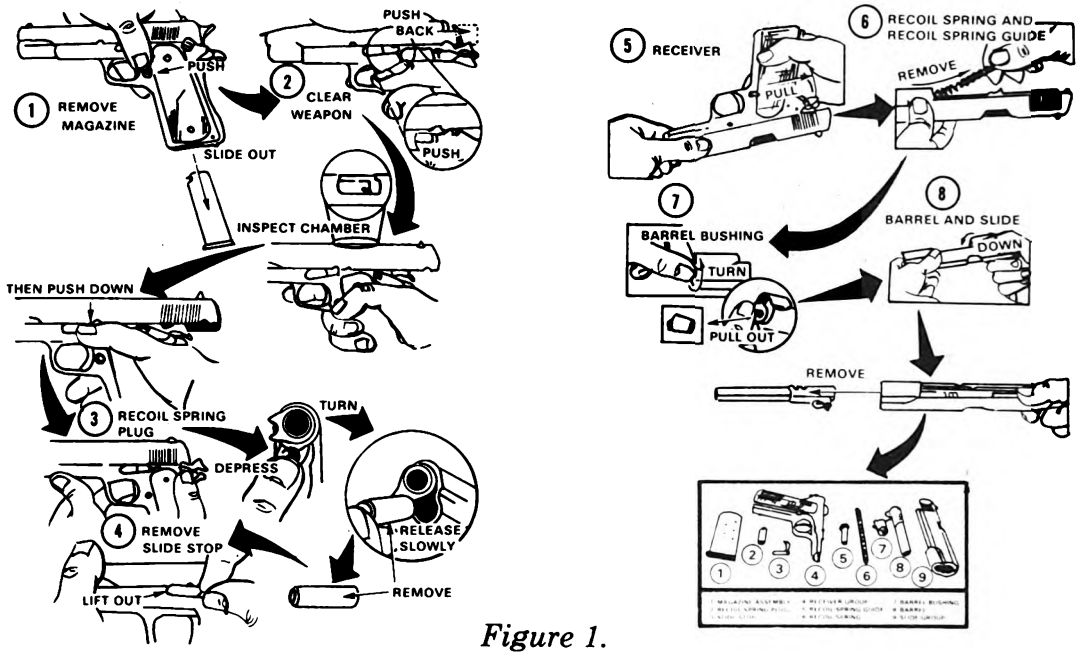

Figure 1.

(2) Hot soapy water may be used to clean the bore when CR is not available. After using the solution, dry barrel thoroughly and apply a light coat of oil.

(3) Volatile mineral spirits, paint thinner, and drycleaning solvent are noncorrosive solvents used for removing oil, grease, or light rust-preventive compounds from weapons. Apply these cleaning agents with a rag to large parts and use them as a bath for small parts.

(4) Cotton wiping rags should be soft and absorbent and free of dust, alkali, or corrosive agents.

b. Lubricants.

(1) Lubricating oil, general purpose, PL Special, is a thin oil used for lubricating above 0°F and for providing temporary protection against rust.

(2) Engine oil, SAE 10, may be used when lubricating and preservative oil cannot be obtained. When engine oil is used, the weapon must be inspected, cleaned, and oiled frequently.

(3) LAW weapons lubricating oil is to be used at temperatures below 0°F.

4. **Care and Cleaning of Caliber .45 Ammunition.**

a. Protect ammunition from mud, sand, dirt, and water. If it appears wet or dirty, wipe clean with a dry cloth immediately. Wipe off light corrosion as soon as it is discovered. Cartridges with heavy coat of corrosion must be turned in to the ammunition supply point.

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b. Do not oil or polish cartridges. Do not attempt to fire cartridges that have dents, scratches, loose bullets, or corroded cases. If a cartridge is defective, turn it in to the ammunition supply point.

c. Ammunition should be stored in an airtight box away from all sources of extreme heat. Do not open ammunition boxes until the ammunition is to be used.

5. **Assembly** (figure 2). When testing the caliber .45 pistol for correct assembly depress the safety lock, pull the slide fully to the rear, and release it by pushing down on the slide stop. The hammer should remain cocked.

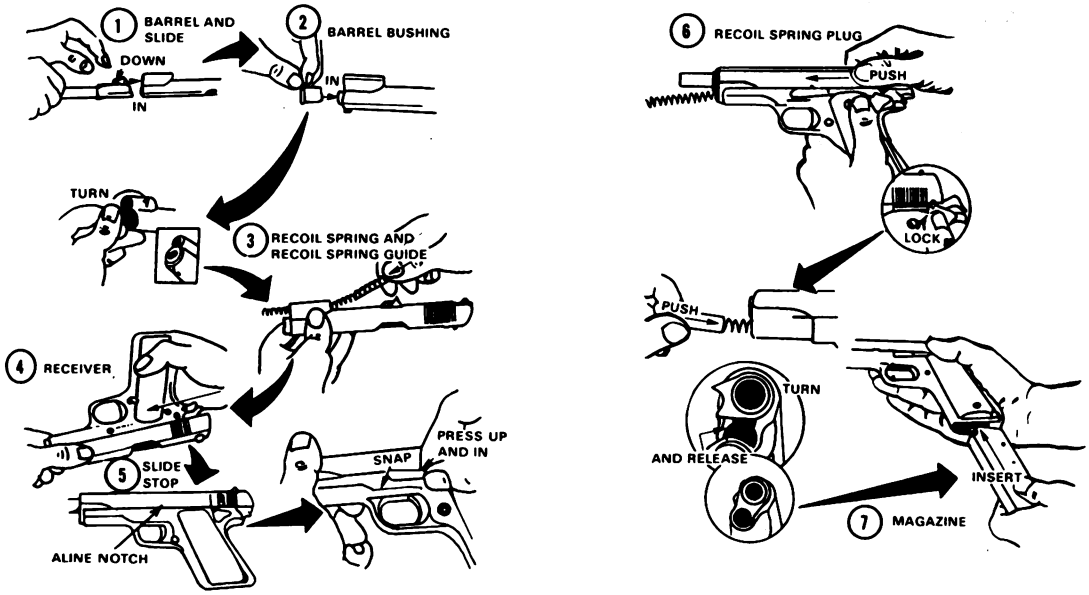

Figure 2.

REFERENCES:

FM 23-35, Pistols and Revolvers, Sep 71 (chap 3, page 35 thru 37, para 25 thru 32; chap 4, page 38, para 35, 37, 38)

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TASK NUMBER: 191-376-0104

ENGAGE TARGETS WITH A CALIBER .45 PISTOL

CONDITIONS:

During daylight, on a combat pistol qualification course (CPQC), given a caliber .45 pistol, 40 rounds of ammunition loaded in eight magazines, two dummy rounds loaded arbitrarily in two magazines, and a requirement to fire tables 1 - 5 for qualification.

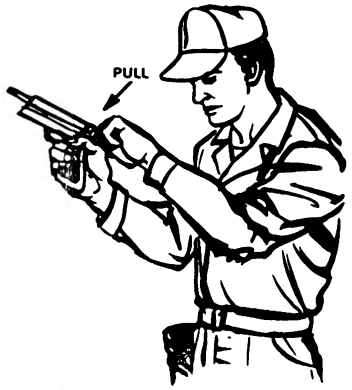
STANDARDS:

1. You must load the pistol, in sequence, IAW performance measure 1.
2. You must clear the pistol, in sequence, IAW performance measure 2.
3. Achieve a minimum score of 160 out of 300.
4. When a stoppage occurs, you must eliminate it by applying immediate action within 15 seconds.

PERFORMANCE MEASURES:

1. Loading (figure 1).
   a. Hold the pistol in the raised pistol position.
   b. Insert the magazine into the pistol.
   c. Pull the slide to the rear and release to chamber a round.
   d. Push the safety lock to the SAFE position.

INSERT MAGAZINE.



PULL SLIDE TO THE REAR AND RELEASE TO CHAMBER ROUND.

PUSH SAFETY LOCK TO SAFE POSITION.

Figure 1.

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2. **Fundamentals of Quick Fire.**

a. Grip. For quick fire without use of the sights, the pistol must act as an extension of your arm. To grip the pistol:

(1) Hold pistol in nonfiring hand as shown in figure 2 and form a "V" with thumb and forefinger of shooting hand.

(2) Place pistol in "V" with sights in line with the firing arm.

(3) Wrap lower three fingers around grip, putting equal pressure with all three fingers straight to the rear.

(4) Place thumb high alongside pistol without applying any pressure with it.

(5) Place trigger finger on trigger so that it can be pulled straight to the rear.

(6) Grip pistol tightly until hand begins to tremble and relax to the point that trembling stops.

(7) If any of the three fingers on the grip are relaxed, the entire grip must be reapplied.

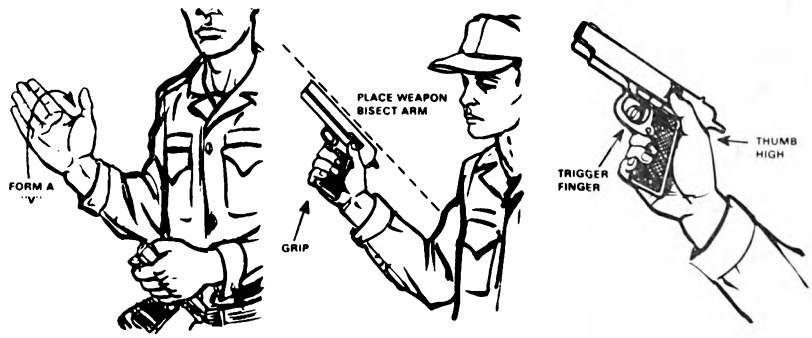

Figure 2.

b. Stance. From a ready position with the feet a comfortable distance apart (figure 3A), bend the knees slightly and thrust the shooting arm forward (figure 3B).

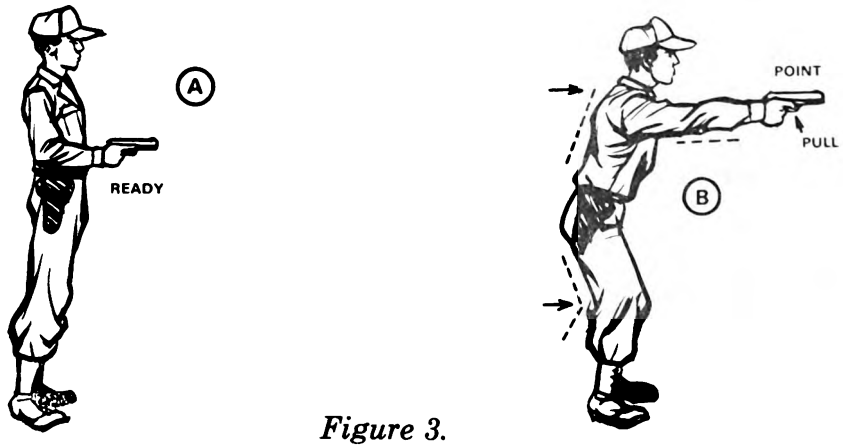

Figure 3.

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3. **Engaging the Target.**

a. Look at the center of the target.

b. Straighten the arm and lock the elbow.

c. Without using sights, point at the center of the target as you would if pointing your finger.

d. As soon as you point the pistol, apply pressure to the trigger evenly and firmly until weapon fires. DO NOT USE SIGHTS.

4. **Immediate action to reduce a stoppage (figures 4 and 5).**

a. In the event the slide is fully forward, the hammer falls, and pistol fails to fire, apply immediate action as follows:

(1) Recock weapon.

(2) Attempt to fire.

(3) 10-second pause (if weapon did not fire).

(4) Eject round and chamber new round.

(5) Attempt to fire again.

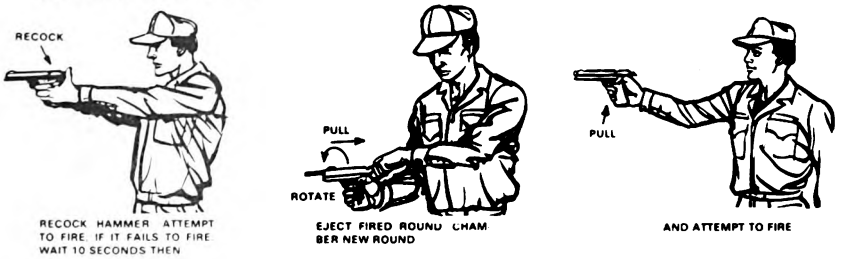
RECOCK
RECOCK HAMMER ATTEMPT TO FIRE. IF IT FAILS TO FIRE WAIT 10 SECONDS THEN
PULL
ROTATE
EJECT FIRED ROUND CHAMBER NEW ROUND
PULL
AND ATTEMPT TO FIRE

Figure 4.

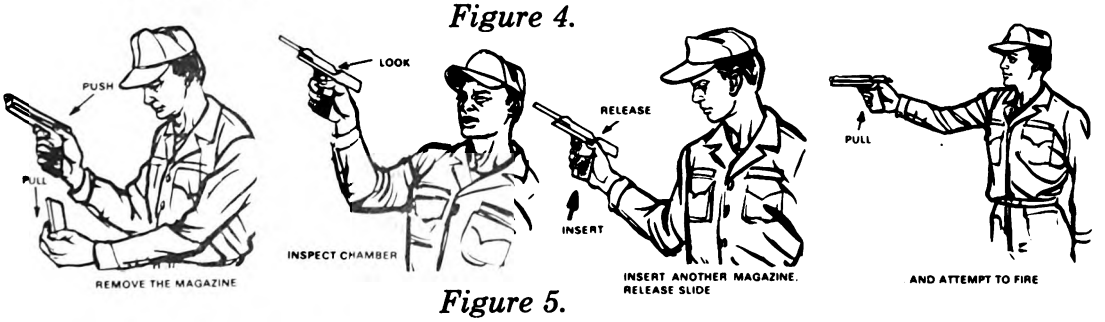

Figure 5.

b. In the event the slide is not fully forward, remove finger from the trigger guard and with the nonfiring hand attempt to push the slide fully forward. If the slide will not move forward, proceed as follows:

(1) Remove magazine.

(2) Inspect chamber.

(3) Insert new magazine and release slide.

(4) Attempt to fire again.

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c. If the weapon does not fire after application of immediate action, as outlined above, make a detailed inspection to determine the cause of the stoppage.

5. **Unloading** (figure 6).

a. Hold the pistol in the raised pistol position.

b. Depress the magazine catch and remove the magazine from the pistol.

c. Point the pistol toward the sky and look into the chamber to be certain it is clear.

NOTE: Slide stays to the rear when the last cartridge in the magazine has been fired.

d. Allow the slide to go forward.

e. Pull the trigger while pistol is in the raised pistol position.

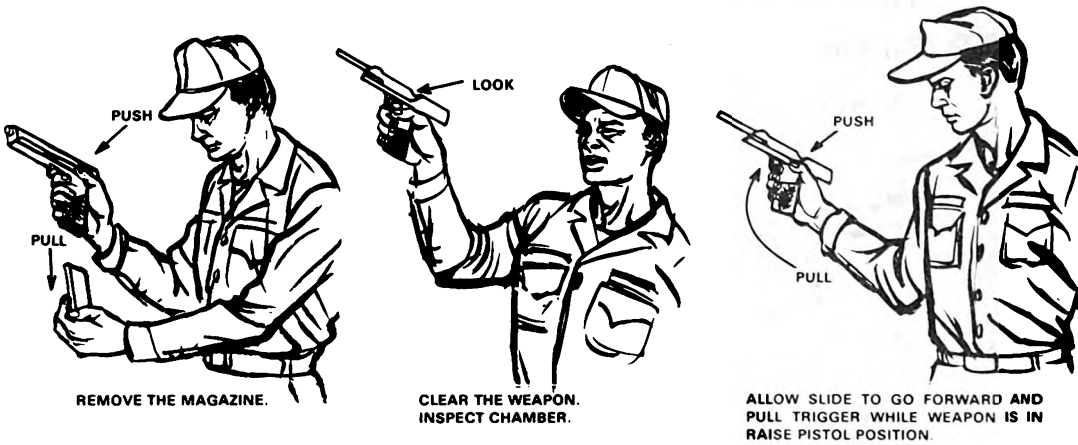

Figure 6.

6. **Clearing.**

a. Hold the pistol in the raised pistol position.

b. Depress the magazine catch and remove the magazine.

c. Pull the slide to the rear and lock it in its rearward position by pushing up on the slide stop.

d. Point the pistol toward the sky and look into the chamber to be certain it is clear.

REFERENCES:

FM 23-35, Pistols and Revolvers, Sep 71 (chap 2, pages 32 thru 34; chap 5, pages 40 thru 52)

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TASK NUMBER: 071-313-3451

PERFORM OPERATOR MAINTENANCE ON A CALIBER .50 M2 HB MACHINEGUN AND AMMUNITION

CONDITIONS:

During daylight, given a caliber .50 M2 HB machinegun with all components, cleaning kit, rags, rifle bore cleaner and special preservative lubricating oil.

STANDARDS:

1. Within 50 minutes, perform general disassembly, inspect, clean, and lubricate the caliber .50 M2 HB machinegun and M3 tripod mount IAW the performance measures below.

2. Assemble the gun and conduct a function check IAW the performance measures below.

PERFORMANCE MEASURES:

Disassembly, cleaning, inspection, lubricating, and assembly should be conducted in the following manner:

1. **Disassembly** (figure 1).

a. Clearing the Gun. Before disassembly, clear the gun as follows:

(1) Unlock bolt latch release and raise the cover (if applicable).

(2) Pull the bolt to the rear and examine the chamber and T-slot to insure they hold no rounds.

NOTE: In darkness, the gunner must feel the chamber and T-slot.

b. Barrel Group. Turn the cover latch shaft lever and raise the cover group. Grasp the retracting slide handle with the left hand, palm down; push the recoiling parts to the rear until the outer lug on the barrel locking spring alines with the ⅜-inch hole in the right sideplate of the receiver. The barrel can be turned only when the locking lug is alined with the ⅜-inch hole. Be careful not to damage the threads or barrel locking notches. Unscrew the barrel and place it on the ground. Allow the bolt to go forward slowly. Take care to prevent the bolt group from slamming forward with the barrel removed.

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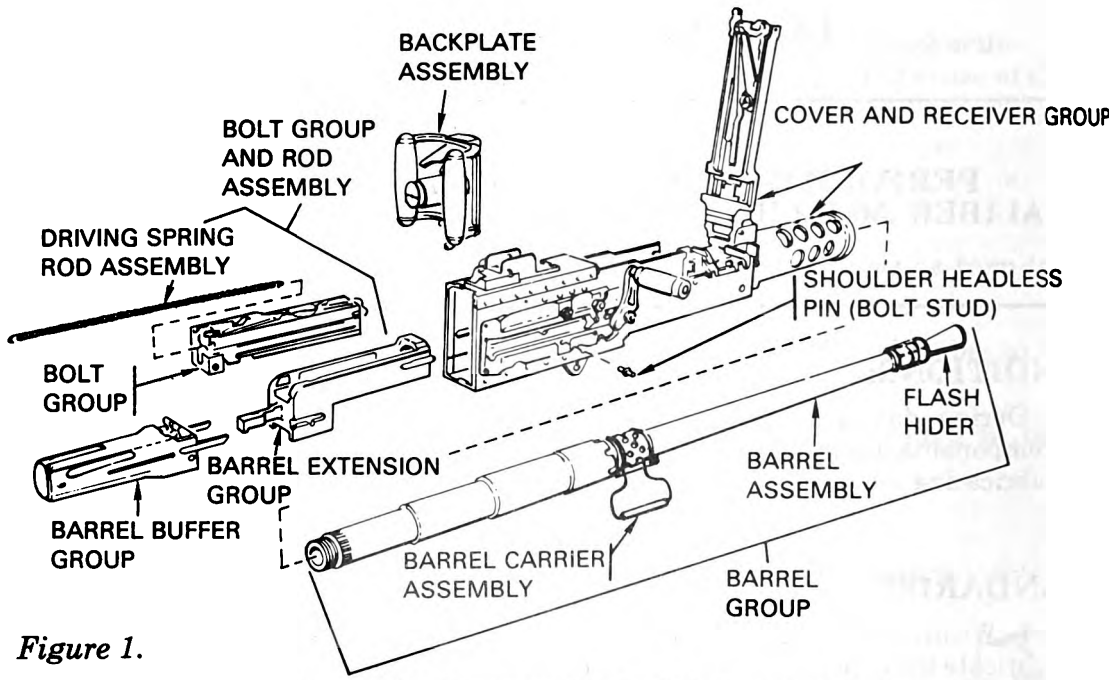

Figure 1.

c. Backplate Assembly. To remove the backplate assembly, insure that the bolt latch release is up. If it is not, push down on the bolt latch release and turn the buffer tube sleeve clockwise until the bolt latch releases. The bolt must be forward before the backplate assembly is removed. If the bolt is to the rear, push down on the bolt latch release and let the bolt ride forward by holding the retracting slide handle. The backplate latch and the latch lock are below the buffer tube. Pull out on the latch lock and up on the latch; remove the backplate assembly by lifting it straight up (figure 2).

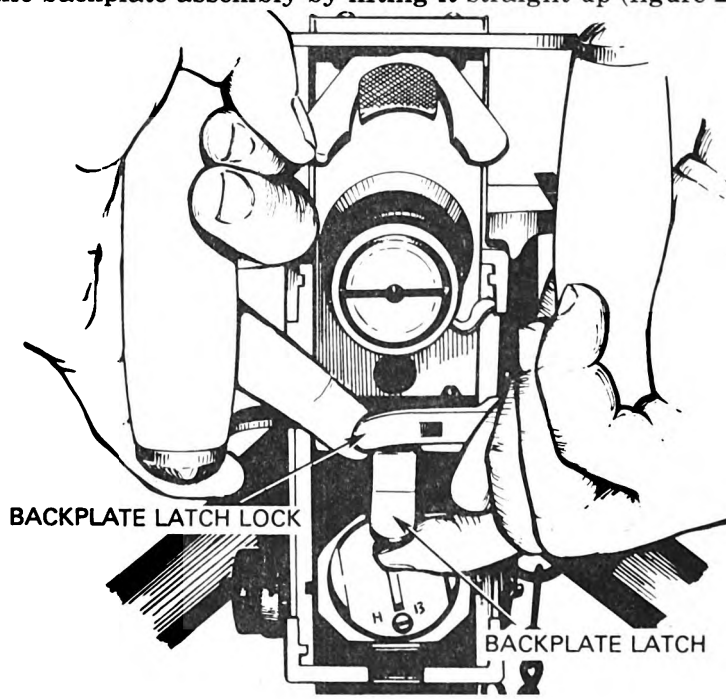

Figure 2.

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d. Driving Spring Rod Assembly. The inner and outer driving springs and the driving spring rod are located next to the right sideplate, inside the receiver. Push in and to the left on the head of the driving spring rod. Pull the driving spring rod assembly to the rear and out of the receiver. A slight pressure is exerted on the driving spring when the bolt is forward; however, never attempt to cock the gun while the backplate is off and the driving spring assembly is in place. If the backplate is off and the driving spring assembly is compressed, the retaining pin on the driving spring rod can slip from its seat in the right sideplate and injure anyone behind the gun.

e. Shoulder Headless Pin (Bolt-Stud). Grasp the retracting slide handle and give it a quick jerk, halfway to the rear, to free the bolt from the barrel extension and move the bolt halfway to the rear. Aline the collar of the bolt stud with the clearance hole in the bolt slot in the right sideplate and remove the bolt stud to the right. If the bolt is accidentally moved all the way to the rear, the bolt latch will engage in the bolt latch notches in the top of the bolt. If this occurs, raise the bolt latch and push the bolt forward to aline the bolt stud with the clearance hole (figure 3).

f. Bolt Group. After freeing the bolt, slide it from the rear of the receiver. Place the bolt down on its side (with the extractor arm up).

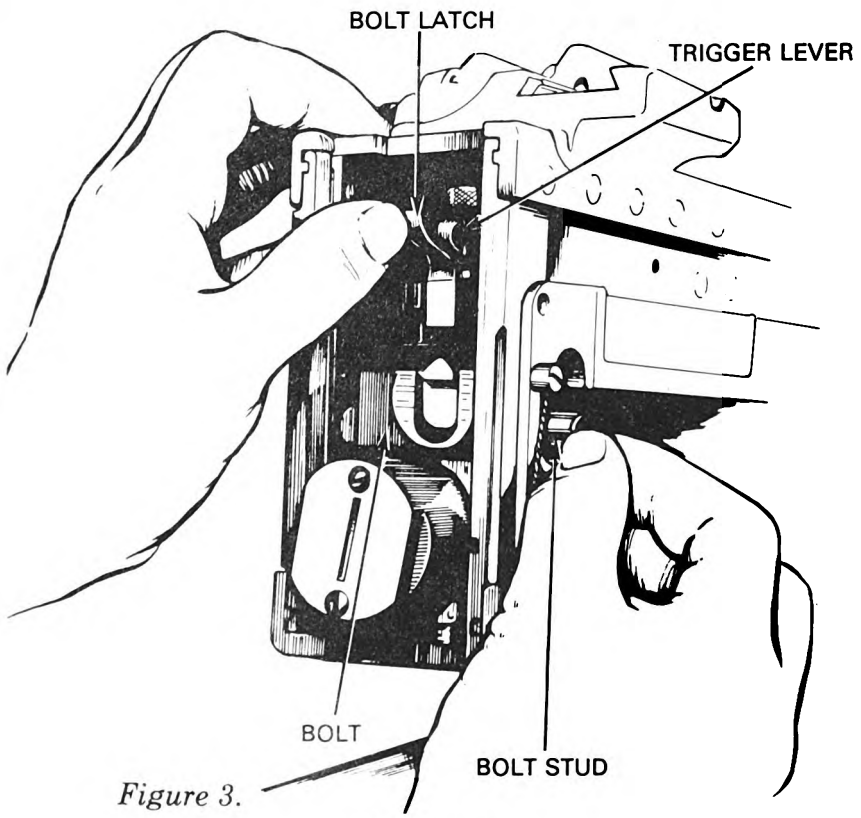

Figure 3.

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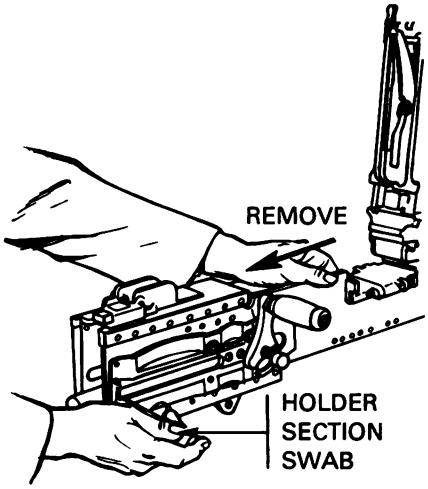
g. Barrel Extension Group and Barrel Extension Group (figure 4). To remove the barrel buffer group and barrel extension group, insert a pointed instrument through the hole in the lower left corner of the right sideplate. Push in on the barrel buffer body spring lock. At the same time, place one hand inside the receiver and push the barrel extension group and buffer group to the rear. Remove the barrel group to the rear. Remove the barrel buffer group and barrel extension group from the receiver. Separate the two groups by pushing forward on the accelerator tips.

h. Barrel Buffer Assembly (figure 5). Pull the barrel buffer assembly from the rear of the buffer body group. The buffer assembly will not be disassembled. This completes general disassembly for limited cleaning and replacement of groups.



REMOVE BARREL BUFFER AND BARREL EXTENSION GROUPS.

Figure 4.

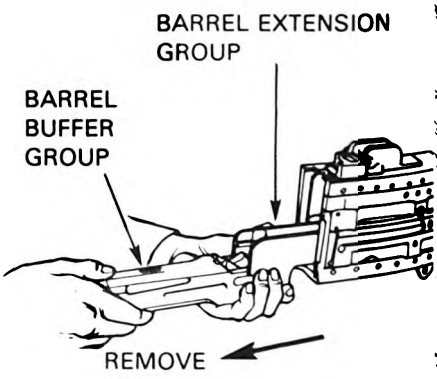


Figure 5.

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2. **Maintenance and Inspection.** Care, cleaning, and maintenance determine whether or not the gun will function properly when needed. The bore and chamber must be properly maintained to preserve accuracy. Because of the close fit of working surfaces and the high speed at which the gun operates, the receiver and moving parts must be kept clean, correctly lubricated, and free from burrs, rust, dirt, and grease to insure proper, efficient functioning.

a. Mount Maintenance. The care, cleaning, lubrication, and adjustment of the mount used with the gun are no less important. The functioning of the gun and mount together determine overall effectiveness. All accessories and equipment used with the gun and mount, including ammunition, must be properly maintained.

b. Maintenance System. To insure proper care of the machinegun, it is necessary to have a system of maintenance or a standing operating procedure (SOP) for the frequency of cleaning. Each gun should be cleaned as soon after firing as possible and each time it is exposed to field conditions. Under combat conditions, the gun should be cleaned and oiled daily. Under extreme climatic and combat conditions, it may be necessary to clean and lubricate more frequently. Under ideal conditions, where the gun is not used and is stored in a clean, dry place, it may only be necessary to inspect, clean, and lubricate every 5 days. The gun should be disassembled, cleaned, and oiled in a clean, dry location, where it is least exposed to moisture, dirt, etc. Maintenance and preparation for storage over a longer period of time is covered in ordnance regulations (Ord 3SNL A-1). If possible, keep the gun covered with a gun cover, canvas, tarpaulin, or poncho when not in use.

3. **Cleaning Materials.**

a. Rifle bore cleaner is used to clean the bore of the machinegun barrel after firing. Immediately after using bore cleaner, dry the bore and any parts of the gun exposed to the bore cleaner; then apply a thin coat of special preservative lubricating oil.

b. When bore cleaner is not available, hot or cold water can be used; however, warm, or hot, soapy water is recommended. After using soap and water, dry the barrel and apply a thin coat of special preservative lubricating oil.

4. **Lubricating.**

a. Special preservative lubricating oil (PL) is a thin oil used for lubricating at normal and low temperatures and for providing temporary protection against rust. The entire gun can be lubricated with this oil.

b. Lubricating oil (LSA) should be used to lubricate all friction-producing parts of the gun as well as exterior parts exposed to the elements. LSA will not burn off during firing or wash off during rain.

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c. In cold climates (consistently below 0°F), lubricate the gun with lubricating oil, arctic weather (LAW) and keep it covered as much as possible. For further information, see TM 9-207 and FM 31-70.

d. In hot, humid climates, inspect the gun frequently for signs of rust. Keep the gun free of moisture and lightly oiled with lubricating oil (LSA).

5. **Care and Cleaning Before, During, and After Firing.**

a. Before firing (when the situation permits), take the following steps to insure efficient functioning of the machinegun:

(1) Disassemble the gun into its major groups or assemblies.

(2) Clean the bore and chamber, but do not oil them.

(3) Clean all metals parts thoroughly and apply a light coat of oil to all metal parts which do not come in contact with the ammunition.

b. To insure complete removal of powder residue and primer fouling from the bore of the machinegun barrel, the bore should be cleaned once each day, for at least three consecutive days after firing. The bore sweats out this fouling or residue, and cleaning must be repeated until there is no further evidence of sweating.

6. **Care and Cleaning Under Unusual Climatic Conditions.** Extreme cold, hot, dry, and tropical climates affect the gun and its functioning. Care should be taken under these climatic conditions to insure that the gun is cleaned daily with the prescribed lubricants and protected from the elements by some sort of cover if possible. Further information on care and cleaning of the gun under unusual climatic conditions can be found in TM 9-1005-213-10.

7. **Assembly.** To asemble the machinegun, replace the groups and assemblies in reverse order of disassembly.

8. **Ammunition.** Ammunition should be clean and dry. One belt of ammunition should remain attached to the weapon, and all other ammunition remain in the can until needed.

REFERENCES:

FM 23-65, Browning Machinegun, Caliber .50 HB, M2, May 72 (chap 2, page 4)
FM 31-70, Basic Cold Weather Manual, C1, Apr 68 (chap 6, page 123)
TM 9-1005-213-10, Operator's Manual: Machinegun, Caliber .50 Browning, M2, C2, Jul 68 (chap 3, pages 48 and 58)
TEC Lesson 941-071-0116-F, Caliber .50 Machinegun, Mechanical Training

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TASK NUMBER: 071-313-3452

TARGET/ZERO A CALIBER .50 MACHINEGUN

CONDITIONS:

During daylight, on a live fire range, given an M3 tripod-mounted caliber .50 HB, M2, machinegun, a target between 400 and 1,000 meters from the firing position, and a 15-round belt of ammunition.

STANDARDS:

Firing single rounds, using the 15 rounds provided, adjust the windage and elevation until a round hits the target.

PERFORMANCE MEASURES:

1. During targeting/zeroing, select a target 400-1,000 meters from the gun position.

2. Place the selected range on the rear sight and aline the windage index (windage zero).

3. Place the gun on single shot.

4. Lay gun on target using the traversing and elevating (T&E) mechanism.

5. Fire a single round at the target and note where the round hits.

6. Making necessary corrections while looking through the rear sight, move the rear sight (windage and elevation) so that the front sight blade is alined with the point of impact of the round.

7. Re-lay on the target using the T&E mechanism.

8. Fire a confirming round. If the adjustments were correct, the round will hit the target.

9. If the confirming round does not hit the target, repeat the same procedures until targeting is completed or until the 15-round belt has been expended.

REFERENCES:

FM 23-65, Browning Machinegun, Caliber .50 HB, M2, May 72 (chap 9, para 134, page 163)
TEC Lesson 941-071-0118-F, Caliber .50 Machinegun Field Zeroing

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TASK NUMBER: 071-313-3453

LOAD, REDUCE A STOPPAGE, UNLOAD, AND CLEAR A CALIBER .50 MACHINEGUN

CONDITIONS:

Given an assembled and cleared caliber .50 machinegun with headspace and time correctly set, a belt of linked caliber .50 ammunition, and a requirement to expend all rounds in the belt. (A dummy round may be inserted in the belt for training purposes.)

STANDARDS:

1. Situation 1: Load and fire the gun within 10 seconds.

2. Situation 2: When a stoppage occurs, it must be eliminated by using immediate action and the next round fired within 10 seconds (but only if round is ejected). Then fire all remaining rounds.

3. Situation 3: Unload and clear gun within 10 seconds.

PERFORMANCE MEASURES:

1. **Loading.**

a. Insure bolt is forward and cover closed.

b. Insert double-loop end of belt in feedway until the first round is engaged by belt-holding pawl.

c. Jerk retracting slide handle to the rear and release it. (If bolt latch release is up, return retracting slide handle to forward postion and then release bolt.) The gun is now "half-loaded".

d. To complete loading, jerk retracting slide handle to the rear a second time and release it. When bolt goes forward for the second time, the gun is loaded.

2. **Firing (single shot and automatic).**

a. Single shot - keep bolt latch release in the up position and release it manually for each round, then push trigger.

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b. Automatic - lock bolt latch release down with bolt latch release lock.

CAUTION:

Never close cover with bolt to the rear.

Never allow bolt to go forward freely with the barrel out of the gun.

Ease it forward with retracting slide handle.

3. **Unloading and clearing.**

a. Cold Gun.

(1) Unlock bolt latch release (if applicable) and raise cover.

(2) Lift the extractor from the ammunition belt.

(3) Lift ammunition belt from feedway.

(4) Pull bolt to rear.

(5) Insure T-slot and chamber hold no rounds.

b. Hot Gun.

(1) Place gun in the single shot mode.

(2) Fire round in chamber.

(3) Open cover; remove ammunition belt.

(4) Press down on bolt latch release allowing bolt to go forward and chamber round in T-slot.

(5) Close cover and either fire or eject round in chamber.

4. **Immediate action.** Immediate action is the action taken to reduce a stoppage without investigating the cause. This action must be accomplished within 10 seconds when the barrel is hot enough to cause a cookoff. Two hundred rounds fired in a 2-minute period may heat the barrel sufficiently to cause a cookoff.

a. If a stoppage occurs, immediately pull the retracting slide handle to the rear and release it; observe if the round is ejected.

b. If a round is ejected, press the trigger and attempt to fire. If the gun does not fire and the barrel is hot enough to cause a cookoff, wait 5 minutes with the bolt in the forward position to preclude damage or injury in the event of a cookoff.

c. If a round is not ejected, or after the 5-minute waiting period, clear the gun and perform remedial action -- inspect the weapon and the ammunition to determine the cause of the stoppage.

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d. After performing remedial action, reload, re-lay on the target, and attempt to fire.

REFERENCES:

FM 23-65, Browning Machinegun, Caliber .50, HB, M2, May 72 (page 10, para 36)
TM 9-1005-213-10, Operator's Manual: Machinegun, Caliber .50, Browning, M2, Jul 68 (page 42, para 2-8)
TEC Lesson 941-071-0116-F, The Caliber .50 machinegun: Mechanical Training
TEC Lesson 941-071-0119-F, Caliber .50 Machinegun, Firing

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TASK NUMBER: 071-313-3454

ENGAGE TARGETS WITH A CALIBER .50 MACHINEGUN

CONDITIONS:

During daylight, on a live-fire range, given a cupola-mounted caliber .50 machinegun, one belt of 200 rounds of caliber .50 (4 x 1) ammunition, three stationary targets (one linear, one linear with depth, and one deep target) and/or a moving target, and a requirement to engage all targets (approximately 50 rounds per target).

STANDARDS:

Engage all targets IAW the performance measures below firing 8- to 10-round bursts.

PERFORMANCE MEASURES:

1. **Sighting and Aiming.** When firing from the cupola mount, do not use the sights. Look over the top of the weapon and adjust fire to the target by the strike of the bullets on the ground, or by the tracer path.

a. Linear Targets. The gunner must engage the entire width of the target. He lays his gun on the center of mass, or portion of the target which presents the greatest threat. The gunner traverses his fire to either flank, then covers the remainder of the target (figure 1).

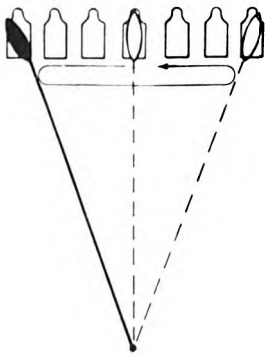

Figure 1.

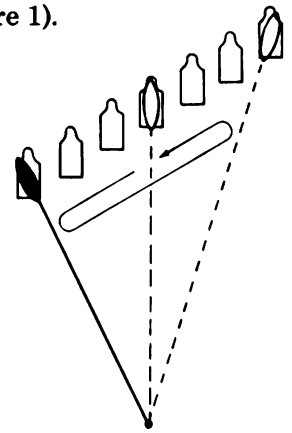

Figure 2.

b. Linear Target with Depth. The gunner must engage the entire width and depth of the target. He lays his gun on the center of mass, or portion of the target which presents the greatest threat. The gunner traverses and searches to the flank closest to his position, then covers the entire target (figure 2).

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c. Deep Targets. The gunner must engage the entire target depth. The gunner lays on the center of mass, or portion of the target which presents the greatest threat. The gunner searches to the portion of the target nearest his position, then the entire target (figure 3).

d. Moving Targets. The gunner must apply correct lead on a moving target. He places his point of aim far enough in front of the target so that his fire and the target meet. (This distance is measured in target lengths. A vehicle at a range of 55 meters moving at 15 mph is given a lead of 1 target length (figure 4).)

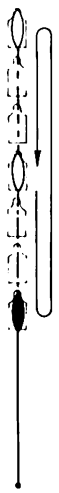

Figure 3.

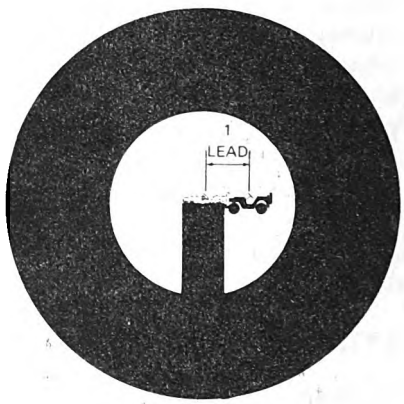

Figure 4.

2. Observation and Adjustment of Fire.

a. Observation. The gunner observes either the dust raised by the strike of the round, or the tracers, and makes adjustment to bring his fire onto the target.

b. Adjustment. When the gunner observes the strike of the rounds, or tracers going high over the target, he immediately ceases fire and starts over again.

3. Cupola (Free Gun) Firing. The gunner grasps both spade grips firmly, locks both elbows to his sides, and presses his chest against the spade grips to steady the weapon. He keeps this position to fire each burst, using no sights.

REFERENCES:

FM 23-65, Browning Machinegun Caliber .50 HB, M2, May 72 (page 134)
TEC Lesson 941-071-0115-F, The Caliber .50 Machinegun: Mounting
TEC Lesson 941-071-0119-F, The Caliber .50 Machinegun: Firing
TEC Lesson 941-071-0125-F, Machinegun Target Engagement, Introduction

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TASK NUMBER: 071-313-3455

SET HEADSPACE AND TIMING ON A CALIBER .50 MACHINEGUN

CONDITIONS:

Given an assembled caliber .50 machinegun (track or tripod mounted) with incorrect headspace and timing, and a headspace and timing gage.

STANDARDS:

Within 10 minutes, the following conditions must be obtained once the gun is cocked and the bolt is forward:

1. **Headspace** - With the retracting slide handle pulled back 1/16-inch (so that the barrel extension is not resting against the trunnion block), the GO end of the headspace gage will enter the T-slot and the NO GO end will not (figure 1).

2. **Timing** - With the NO FIRE timing gage inserted between the barrel extension and the trunnion block (with the beveled edge of the gage on the barrel notches), the firing pin will not release when the trigger is depressed. When the NO FIRE timing gage is replaced by the FIRE gage, the firing pin will release when the trigger is depressed (figure 2).

PERFORMANCE MEASURES:

1. **Headspace Adjustment with the Gage** (figure 1).

a. Raise the cover. Retract the recoiling parts and screw the barrel all the way into the barrel extension, then loosen the barrel a measure of two notches or clicks.

b. Pull the retracting slide handle to its rearmost position. Hold the handle to the rear and press the bolt latch release, allowing the bolt to go forward slowly to prevent damage of parts.

NOTE: Be careful not to depress the trigger, since this will cause the firing pin to be released.
The firing pin should never be released with the gage in the T-slot as this could damage the firing pin and gage.

c. Pull the retracting slide handle back until the barrel extension is 1/16-inch from the trunnion block.

d. Insert the GO end and the NO GO end of the headspace gage in the T-slot. If the GO end of the gage enters freely down to the center ring on the gage and the NO GO end does not enter, headspace is correct.

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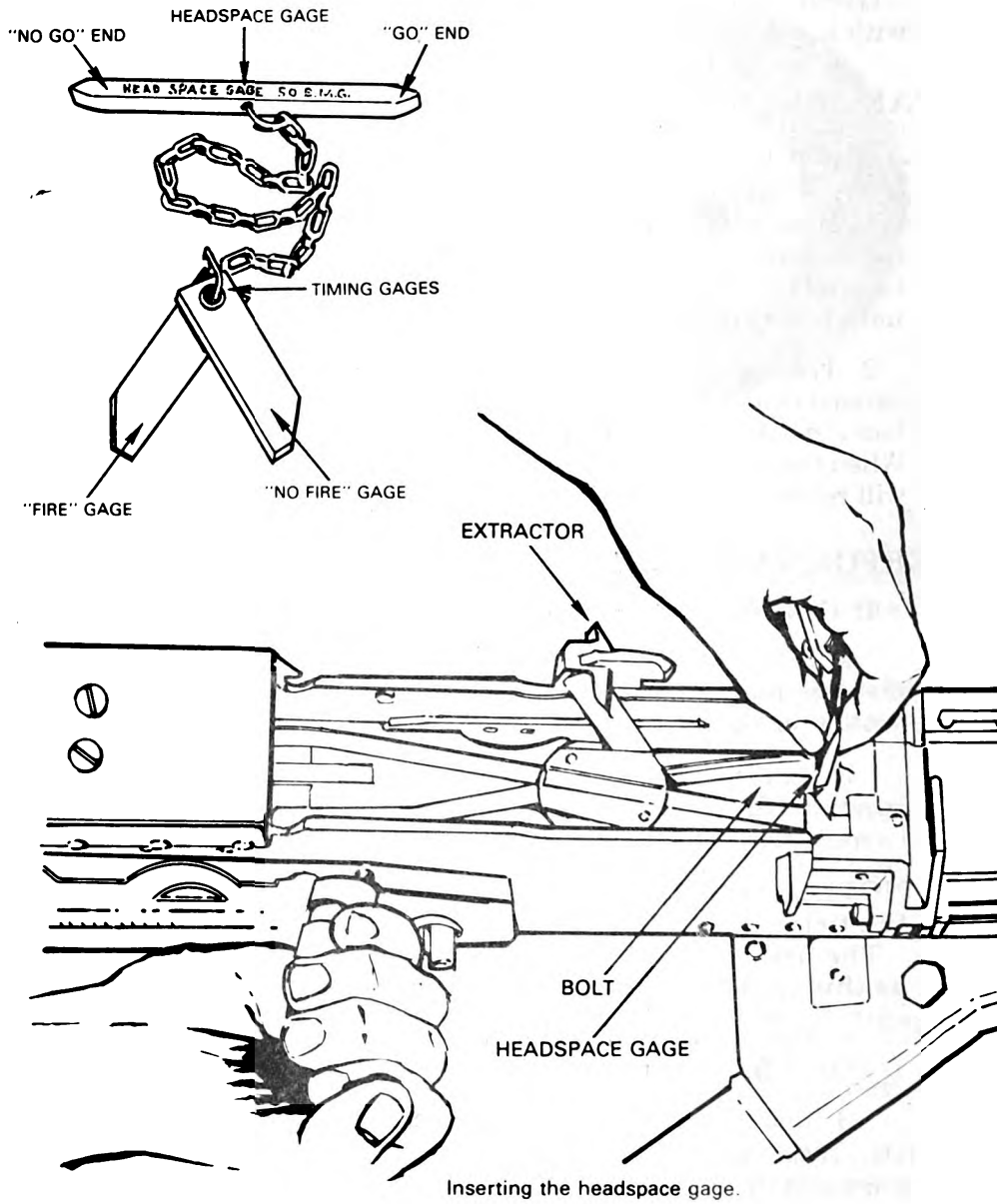
e. If the GO end of the gage does not enter freely, the barrel must be unscrewed one notch (or click) at a time (check with the gage after each notch), until the GO end of the gage enters freely. To complete the adjustment, try to insert the NO GO end of the gage. If it does not enter, headspace is correct.

f. If the NO GO end of the gage enters the T-slot, headspace is too loose. The barrel must be screwed into the barrel extension (one click at a time), checking with the gage after each click, until the GO end enters and the NO GO end does not.

Figure 1.



Inserting the headspace gage.

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2. **To Set the Timing**

a. After headspace has been set, insure the gun is cocked and all moving parts are fully forward. Then pull back on the retracting slide handle with the right hand palm up, making a large enough separation between the trunnion block and the barrel extension to insert the "FIRE" gage. Place the beveled edge of the gage against the barrel notches, then allow the bolt to go forward by releasing the retracting slide handle.

b. The next step is to remove the backplate. To remove the backplate you must pull out on the backplate latch lock and up on the backplate latch and spade grips.

c. Inside the back of the receiver you will see the trigger lever and timing adjustment nut. Screw the timing adjustment nut down, to the left, until it rests lightly on the trigger lever. Apply strong pressure upward on the trigger lever with your thumb; the gun should not fire.

d. To set timing, turn the timing adjustment nut up, or to the right, one click at a time. After each click apply strong pressure upward on the trigger lever, attempting to release the firing pin.

e. When you hear the gun fire, turn the timing adjustment nut up two additional clicks. The reason for the additional clicks is, there are six clicks of timing between early and late timing. The gun has already fired on the first click, two more will give you a total of three clicks and approximate center of the proper timing adjustment.

f. Replace the backplate, remove the "FIRE" gage and recock the gun. Then push the bolt latch release and ease the bolt forward.

3. **To Check the Timing.**

a. Move to the side of the gun and push back on the retracting slide handle and insert the "NO FIRE" gage in the same place the "FIRE" gage was, between the barrel extension and the trunnion block. The beveled edge of the gage should be against the barrel notches.

b. Depress the trigger; the gun should not fire. If the firing pin is released, the timing is too early. If early timing exists, the gun will fire two rounds and stop firing because the extractor does not come far enough forward to extract another round.

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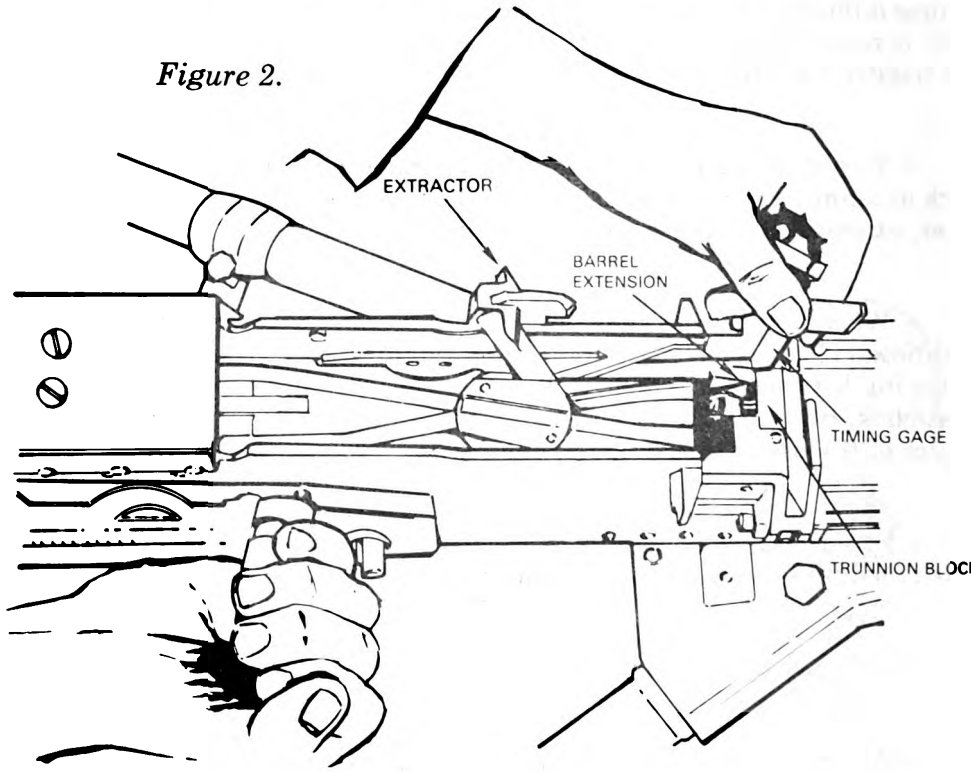
c. To correct early timing, remove the backplate and turn the timing adjustment nut all the way down until it rests lightly on the trigger level and begin again. This time insure that you press up firmly on the trigger lever each click. If the firing pin does not release when the "NO FIRE" gage is inserted, remove it and reinsert the "FIRE" gage. If the firing pin is released when the trigger is depressed, proper timing has been set.

4. **There is a field expedient method for setting headspace and timing, but this field expedient method will not be used in training.**

a. To set headspace using the field expedient method, screw the barrel in all the way and back off two clicks or notches. Fire the gun. If it fires sluggishly, unscrew the barrel **one** more notch, and only **one notch,** and fire.

b. To set timing, one dime or one dog tag can be used as a "FIRE" gage. For a "NO FIRE" gage, one nickle and one dime or four dog tags may be used.

Figure 2.



REFERENCES:

FM 23-65, Browning Machinegun Caliber .50 HB, M2, May 72 (chap 3, sec I, page 77)
TM 9-1005-213-10, Operator's Manual: Machinegun, Caliber .50 Browning, M2, Jul 68 (page 18, para 2-4)
TEC Lesson 941-071-0117-F, Caliber .50 Machinegun, Headspace and Timing

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TASK NUMBER: 071-325-4401

PERFORM SAFETY CHECKS ON HAND GRENADES

CONDITIONS:

Given any standard issue hand grenade.

STANDARDS:

Within 10 minutes:

1. Inspect grenade for any obvious defects.
2. Correct defects found; if not possible, turn in the grenade.
3. Demonstrate and use the correct procedure for carrying grenades.

PERFORMANCE MEASURES:

1. **Inspect Grenade for Defects** (figure 1):

a. Check to INSURE THAT FUZE IS NOT UNSCREWED from body of grenade.

b. Check to INSURE THAT SAFETY CLIP IS IN CORRECT POSITION.

c. IF NO SAFETY CLIP IS PRESENT, ATTACH CLIP to the grenade as follows:

(1) Slide clip onto handle.

(2) Attach loop portion of clip around grenade fuze.

(3) Snap clip end around grenade safety lever.

d. Check safety pin.

(1) If pin is partially removed, carefully push it into place while holding lever securely down.

(2) If pin is bent, carefully bend it back into position.

e. CHECK SAFETY RING. Reject grenade if safety ring is cracked.

f. CHECK LEVER. Reject grenades with broken lever.

g. CHECK FOR DIRT. If dirty or grimy, wipe with damp or dry cloth.

h. CHECK FOR RUST. Turn in grenade if rust is eating through it.

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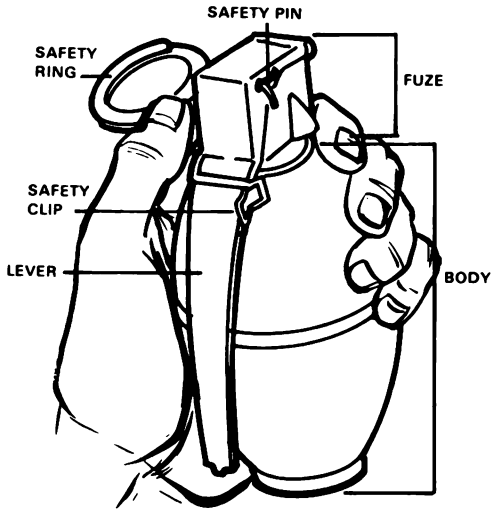

Figure 1.

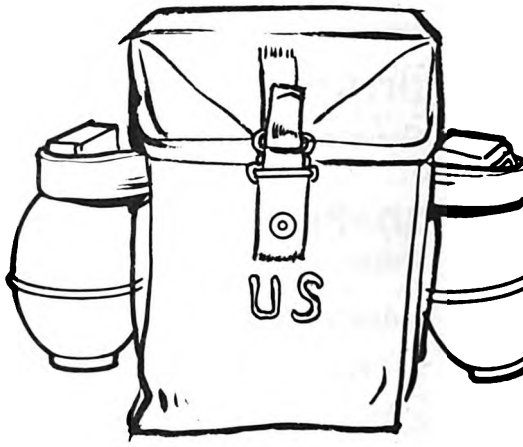

Figure 2.

2. **Attaching Grenades to Ammo Pouches** (figure 2):

a. First check the fuze for tightness. After checking the fuze for tightness, hold the web carrying sleeve on the side of the ammunition pouch and slide the grenade's safety lever into the sleeve.

b. Be sure the pull ring or the safety pin is pointing downward.

c. Wrap the carrying strap around the neck of the fuze, including the safety lever and the pull ring, and snap the carrying strap to the carrying sleeve.

d. While moving, occasionally check the grenade to make certain the fuze is tight and the carrying strap is secure.

REFERENCES:

FM 23-30, Grenades and Pyrotechnic Signals, Dec 69 (chap 3, page 21)
TEC Lesson 942-071-0002-F, Hand Grenade Maintenance and Identification
TM 9-1330-200-12, Operator's and Organization Maintenance Manual: Grenades, Hand and Rifle, Sep 71 (chap 3, sec III, page 3-4, para 3-7)

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TASK NUMBER: 071-325-4402

ENGAGE ENEMY TARGETS WITH HAND GRENADES

CONDITIONS:

During daylight; wearing LBE, with individual weapon, given five M69 practice hand grenades, five M288 practice fuzes, and a requirement to engage the following targets at the designated ranges.

Target 1 - dismounted enemy troops clustered at a range of approximately 35 meters. The situation and available cover will not permit moving closer to the target.

Target 2a - an enemy position with overhead cover (bunker, building, cave, etc.) which can be approached along a covered route.

Target 2b - an enemy emplacement without overhead cover (foxhole, trench or mortar emplacement) at a range of 20 meters. The situation and available cover will not permit moving closer to the target.

Target 3 - an enemy position with overhead cover (bunker, building, cave, etc.) which can be approached along a covered route.

STANDARDS:

For each target, throw at least one grenade so that it explodes within the effective bursting radius for that target as listed below without exposing yourself for more than 3 seconds at any one time.

TARGET	EFFECTIVE ENGAGEMENT
No. 1 Troops in the open	Within 5 meters of center
No. 2 Troops dug in without overhead cover	Inside of position
No. 3 Troops with overhead cover	Inside of enclosure

PERFORMANCE MEASURES:

1. **Throwing Hand Grenades.**

a. The Grip. The safest and easiest way to grip a hand grenade for throwing is to hold it so that the safety lever is held down by the thumb while keeping the pull ring (and safety clip if present) free and facing the nonthrowing hand (figures 1 and 2).

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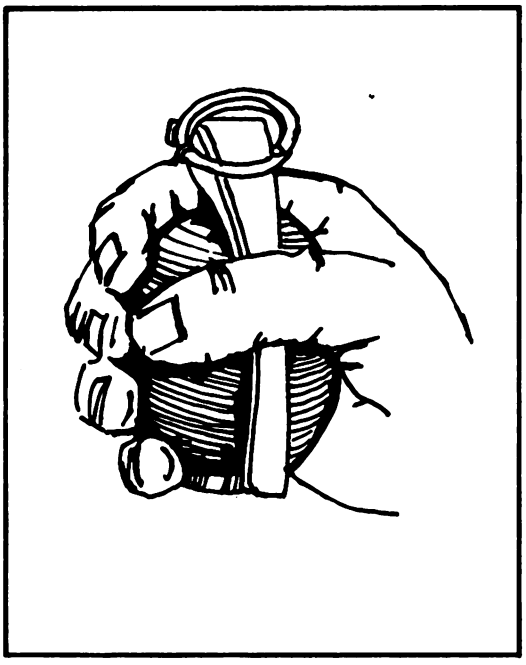
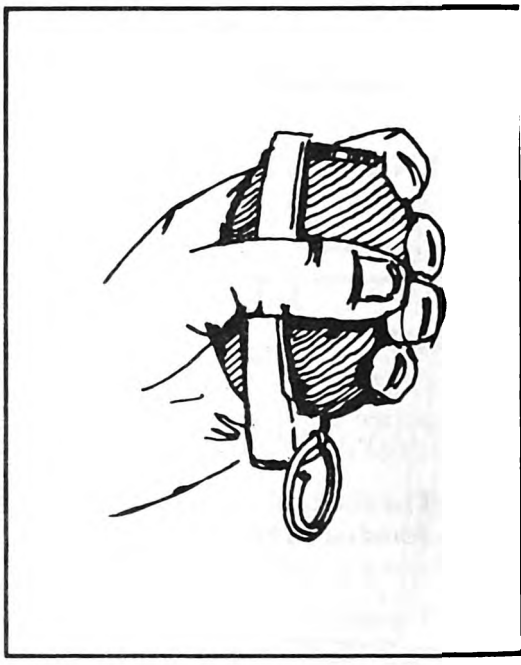


Proper grip of the grenade (right-hand thrower).

Figure 1.



Proper grip of the grenade (left-hand thrower).

Figure 2.

b. Body Positioning and Arming. No matter what position is used (standing, kneeling, prone) when throwing a hand grenade, you should be as comfortable and natural as possible. The two most important points in accurate throwing are body-target alinement and eye-target focus. Line your body up with the target as though you were going to throw a football or baseball. Keep watching the target as you throw, and let your arm swing naturally to it. Follow through with your throwing motion and take cover. If possible, you or a buddy should watch where the grenade lands. Make sure you properly arm the grenade before you throw it. Remove the safety clip, pull the pin, throw the grenade.

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c. To Throw a Hand Grenade (figure 3):

(1) Look at the target and judge the distance to it.

(2) Line your body up so you can throw comfortably.

(3) Hold the grenade under your chin and with the index finger of your other hand pull and twist the pull ring (at the same time pull the safety clip off the lever with your thumb).

(4) As the pin is removed, look back at your target.

(5) Keeping your eye on the target, throw the grenade overhanded.

(6) Release the grenade after it comes into your field of vision and follow through.

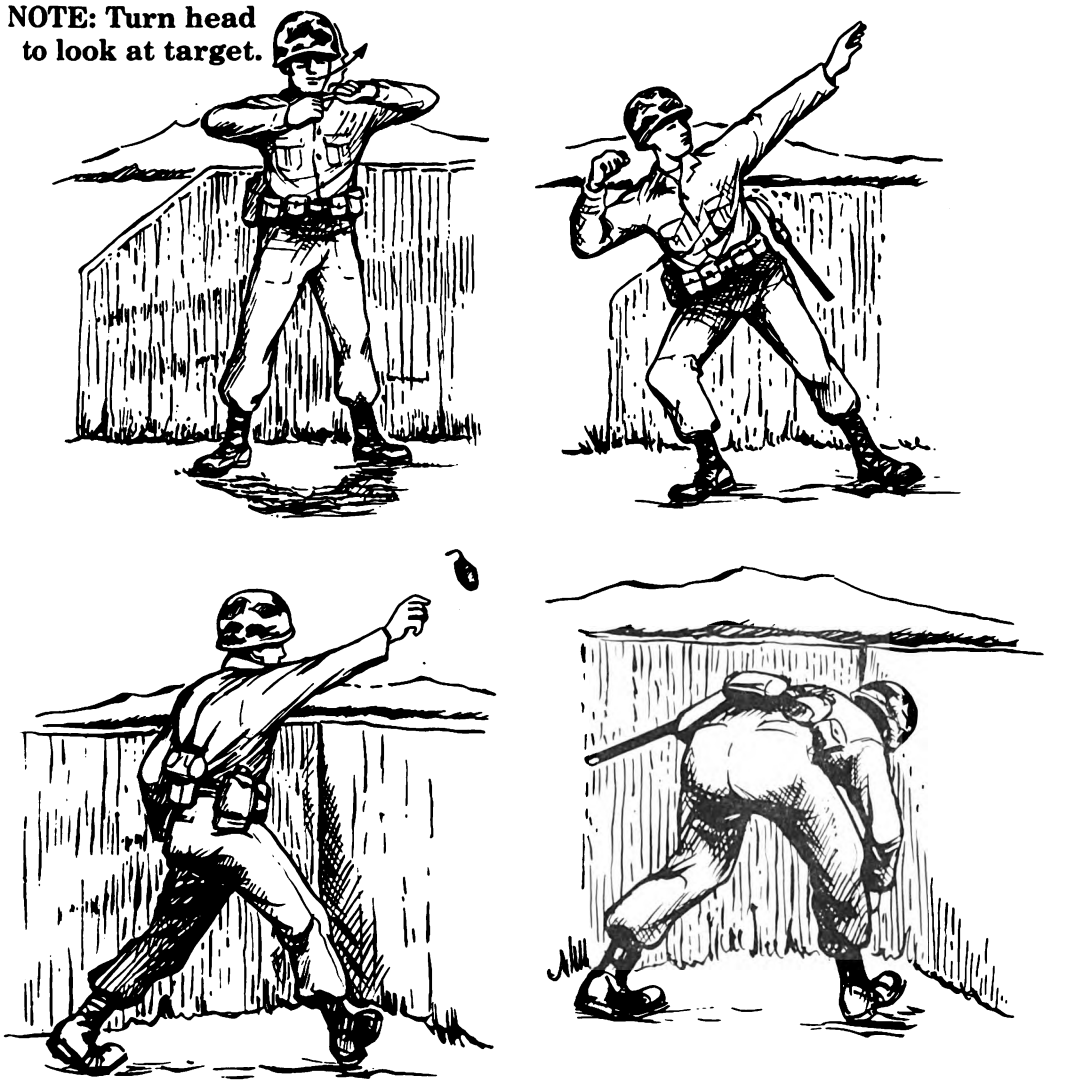

Figure 3. Throwing a grenade.

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NOTE: One exception to this procedure is the riot control grenade ABC-M25A2. Since there is no lever, you must hold the arming sleeve down instead. Use the thumb of your throwing hand to do this.

d. Using Fragmentation Grenade M67 with Time Delay Fuze M213 (figure 4). This grenade is your best all-round choice. It can be thrown a little over 40 meters by most soldiers and will kill or injure exposed soldiers who are within 15 meters if it when it explodes. You should, with some practice, be able to throw the grenade to within 5 meters of a selected point 35 meters away from you or within a fighting position 2 meters wide at 20 meters range. Grenades thrown at these targets may hit and roll into the target area, but you should practice to hit the fighting position 'on the fly' in order to destroy positions with frontal cover. Another technique which can be employed with these grenades is the cookoff. To do this, you release the safety lever and hold the grenade for a two count (YOU MUST NOT HOLD IT LONGER, HOWEVER). Then when the grenade is thrown, enemy personnel will not have time to pick it up and throw it back. In addition, if it is thrown high into the air, it can explode over the target (airburst).

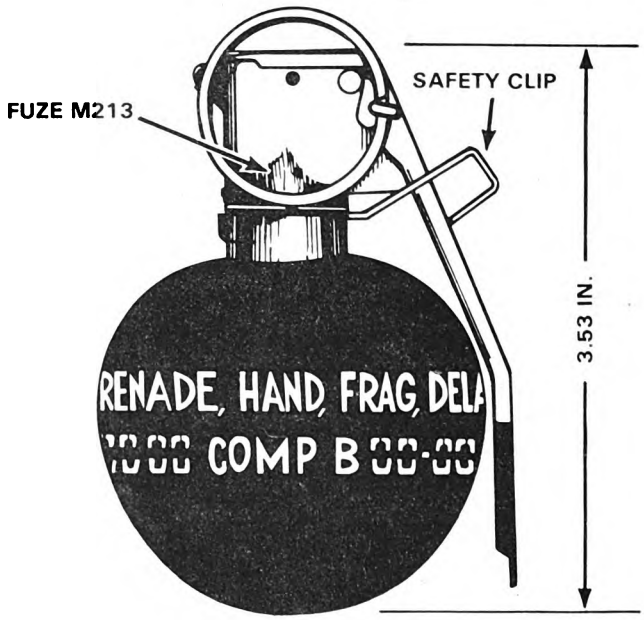

Figure 4. Fragmentation hand grenade M67.

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e. Safety.

(1) Do not modify grenades in any way (tape or wire, etc.).

(2) Do not attempt to defuze grenades.

(3) Do not remove or use grenades found upside down in their packing containers.

(4) Do not handle dud grenades at anytime.

(5) Do not attach grenades to clothing or equipment by the pull ring.

(6) When using the cookoff technique, do not hold the grenade for more than 2 seconds for any reason.

2. **Training Tips.**

a. Train for results, not the process. Distance and accuracy are the desired results of training, not constant practice of step-by-step body positions. Concentrate on body-target alinement, eye-target focus, safety procedures, and the result - a target kill.

b. Use training grenades (of the type similar to the grenades in your unit's ASP) with practice fuzes. Use expended practice fuze heads with safety levers, safety pin, and safety clip for all training when 'live' practice fuzes are not available.

c. Key on not exposing yourself for more than 3 seconds when throwing grenades.

d. Train to minimum standards and then go on to continually higher standards and more complicated techniques (cookoff and airbursts).

REFERENCES:

FM 23-30, Grenades and Pyrotechnic Signals, Dec 69 (chap 2, page 8; chap 3, page 21)
TM 9-1330-200-12, Operator's and Organization Maintenance Manual: Grenades, Hand and Rifle, Sep 71 (chap 2, pages 2-5 and 2-45)
TEC Lesson 942-071-0001-F, The Hand Grenade - Types and Uses
TEC Lesson 942-071-0002-F, Hand Grenade Maintenance and Identification
TEC Lesson 942-071-0003-F, The Hand Grenade - Carrying, Arming, and Throwing

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TASK NUMBER: 071-325-4405

IDENTIFY AND EMPLOY HAND GRENADES

CONDITIONS:

During daylight, in a field location, wearing field clothing, steel helmet, and load-bearing equipment (LBE), and carrying your individual weapon and basic load of ammunition, given fragmentation grenades with time-delay fuzes, fragmentation grenades with impact-detonating fuzes, offensive (concussion) hand grenades and several special purpose grenades.

STANDARDS:

1. Be able to identify any of the hand grenades listed in performance measure 1 by its shape, color, and/or marking.

2. Select the correct hand grenade for each of the following:

   a. To disable or kill personnel.

   b. To signal.

   c. To screen (provide concealment).

   d. To control riots or disable without serious injury.

PERFORMANCE MEASURES:

1. **Identification of hand grenades.** You must be able to identify those grenades which you will usually find within your unit by their shape, color, and/or markings. Figures 1 through 6 will assist you in becoming familiar with the more common grenades currently available.

2. **Uses of hand grenades.** Hand grenades can assist you in accomplishing six different missions:

   a. To disable or kill personnel - Use fragmentation or concussion grenades (M67, M68, M26A1, M56, M57, M33, M59, or MK3A2). Fragmentation grenades M68, M57. and M59 are fuzed for exploding on impact after 1 second or within 4 seconds without impact. The other frag grenades (M67, M26A1, and M56) and the offensive (concussion) grenade MK3A2 will explode 4 to 5 seconds after the safety lever is released.

   b. To signal - Use M18 Colored Smoke or M34 WP Smoke. [Extreme caution should be used if the M34 is used since it can produce casualties up to 35 meters away from where it explodes.]

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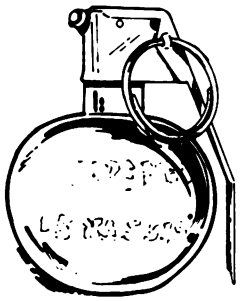

Figure 1. M33, FRAGMENTATION HAND GRENADE. Color/Markings - OD with single yellow band and printing.

Figure 2. ABC-M25A2, CS RIOT CONTROL HAND GRENADE. Color/Markings - Gray, red band(s) and red printing.

Figure 3. M34, WP SMOKE HAND GRENADE (STANDARD COLOR AND MARKINGS). Color/Markings - Light green, yellow band, red printing.
Old Markings - Light gray, yellow band, yellow printing.

Figure 4. AN-M8, HC SMOKE HAN GRENADE. Color/Markings - Lig green, black printing, white top.
NOTE: M18 Colored Smoke looks t same but the top is the same color as t smoke.

Figure 5. An/M14, TH 3 INCENDIAR HAND GRENADE. Color/Markings Light red with black printing.
Old Markings - Gray with purple ba and purple printing.

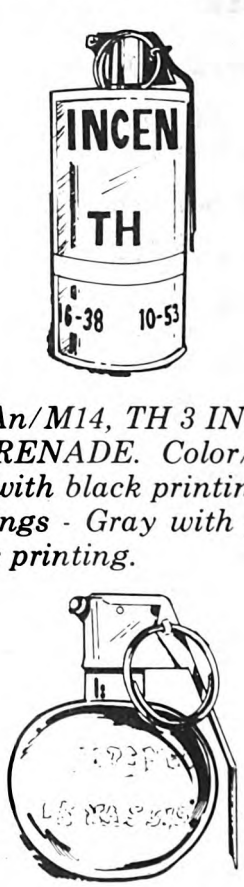

Figure 6. M67, FRAGMENTATIO HAND GRENADE. Color/Markings Same as M33.
NOTE: M68 looks the same but has r safety lever with word "IMPACT" on

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c. To screen (provide concealment) - Use AN-M8 Smoke Grenade. If the AN-M8 is not available, the M18 Colored Smoke or M34 Smoke may be used although they are not as effective as the AN-M8. [If M34 WP Smoke grenades are used, use caution as noted in b., above.]

d. To provide light (illuminate) - Use the MK1.

e. To start fires - Use the AN-M14, TH 3 Incendiary. [The M34 WP Smoke, MK1, and canister-shaped riot control grenades can also start fires but should not be relied upon.]

f. To control riots or disable without serious injury - Use the riot control grenades ABC-M7A2 (canister-shaped) or ABC-M25A2 (baseball-shaped) grenades. [Caution: The ABC-M25A2 is a bursting-type grenade which can cause injury up to 5 meters away.]

3. **Employing hand grenades.**

NOTE: This section will address fragmentation and offensive (concussion) grenades only, since these are the ones you will normally be required to use.

a. Fragmentation grenade with time delay fuze: M67 (figure 6 and the M33 (figure 1).

These grenades are your best all-round choice. They can be thrown a little over 40 meters by most soldiers and will kill or injure exposed soldiers who are within 15 meters of them when they explode. You should, with some practice, be able to throw the grenade to within 5 meters of a selected point 35 meters away from you or within a fighting position 2 meters wide at 20 meters range. Grenades thrown at these targets may hit and roll into the target area, but you should practice to hit the fighting position 'on the fly' in order to destroy positions with frontal cover. Another technique which can be employed with these grenades is the cook-off. To do this, you release the safety lever and hold the grenade for a two count (YOU MUST NOT HOLD IT LONGER, HOWEVER). Then when the grenade is thrown, enemy personnel will not have time to pick it up and throw it back. In addition, if it is thrown high into the air, it can explode over the target (airburst).

b. Fragmentation grenade with impact-detonating fuze: M68, M57 and M59.

Like the time delay grenades, these can be thrown about 40 meters and have the same effect except that they explode as soon as they hit something. With these, you must hit the target 'on the fly,' not on a bounce or roll. For safety, they do not arm until 1 second after releasing the lever, so if you drop it you can still recover it and throw it. If it hits something before 1 second has passed and comes to rest, it will explode after 3 or 4 more seconds. This grenade is best used when you want to insure enemy soldiers don't return it or on steep hills where the delay fuze grenade might roll away from the target.

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c. Offensive hand grenade, MK3A2. This canister-shaped grenade can also be thrown about 40 meters, but its effectiveness against targets in the open is not very good. Against targets in confined spaces such as rooms, bunkers, or caves, it is the best choice.

REFERENCES:

FM 23-30, Grenades and Pyrotechnic Signals, Dec 69 (chap 2, page 5, para 3; pages 8 thru 20, para 9 thru 30)
TEC Lesson 942-071-0001-F, The Hand Grenade - Types and Uses
TEC Lesson 942-071-0002-F, Hand Grenade Maintenance and Identification

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TASK NUMBER: 051-192-1502

INSTALL AND FIRE/RECOVER AN M18A1 CLAYMORE MINE

CONDITIONS:

Given an M18A1 antipersonnel mine (inert) (claymore), an M57 firing device, an M40 test set, and a firing wire with inert blasting cap, packed in an M7 bandoleer; a designated installation site; a firing position at least 16 meters from the installation site; and a sandbag.

STANDARDS:

1. Install the claymore facing the center of mass of a kill zone.
2. Claymore is recovered and repacked in the bandoleer if not detonated.

PERFORMANCE MEASURES:

1. **Installing the M18A1 Claymore Mine.**

a. Account for all accessories in the bandoleer (figure 1) and read the attached instruction sheet. Remove the electrical firing wire, leaving the mine and other accessories in the bandoleer.

WARNING: During installation, the M57 firing device must be kept in the possession of the individual installing the mine to prevent accidental firing by another individual.

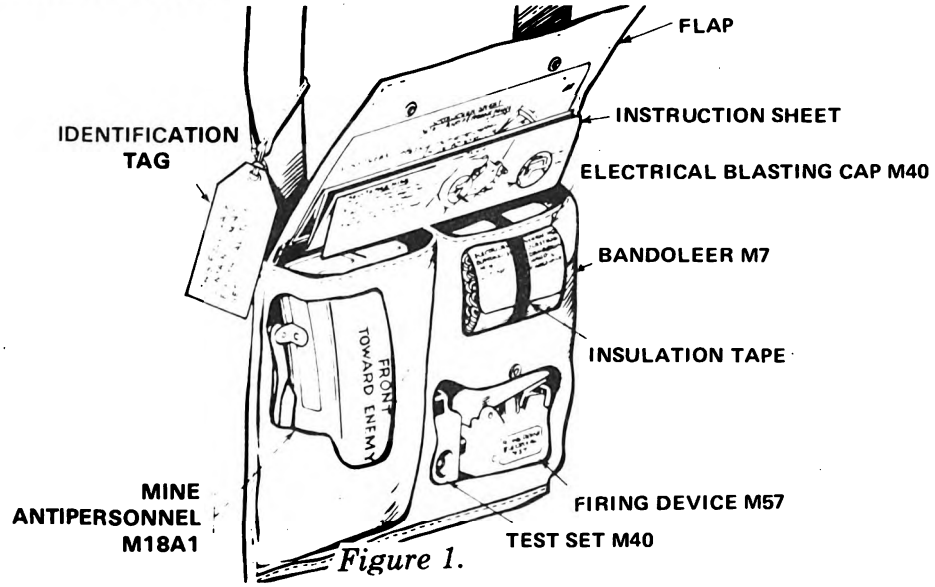

Figure 1.

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b. Tie the shorting plug end of the firing wire (figure 2) to a fixed object (stake, tree, etc.) at your firing position. Place the bandoleer on your shoulder and unroll the firing wire to the selected position for emplacing the mine.

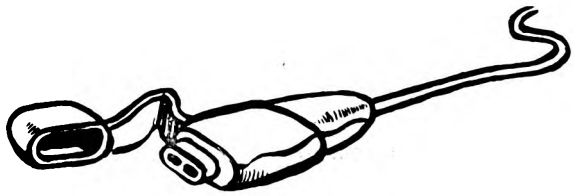

Figure 2.

c. Remove the mine from the bandoleer. Open both pairs of legs to a 45-degree angle with two legs facing to the front and two legs facing to the rear of the mine (figure 3).

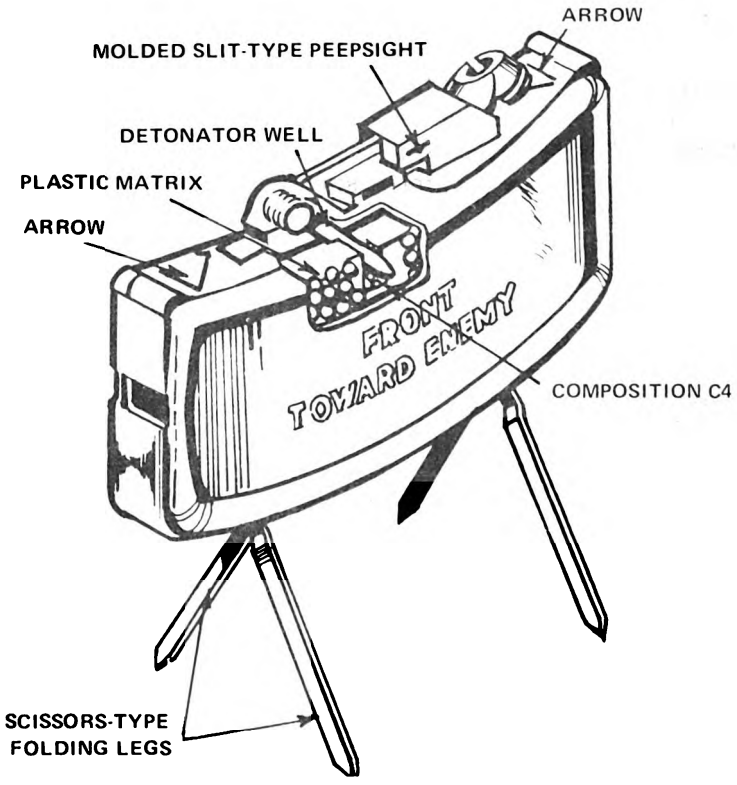

Figure 3.

c. Push the legs approximately 1/3 of the way into the ground with the mine facing in the desired direction of fire.

2. **Aiming the Mine.**

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a. Select an aiming point (tree, large rock, etc.) approximately 50 meters (150 feet) to the front of the mine and approximately 2½ meters (8 feet) above the ground using the slit-type peepsight (figure 4).

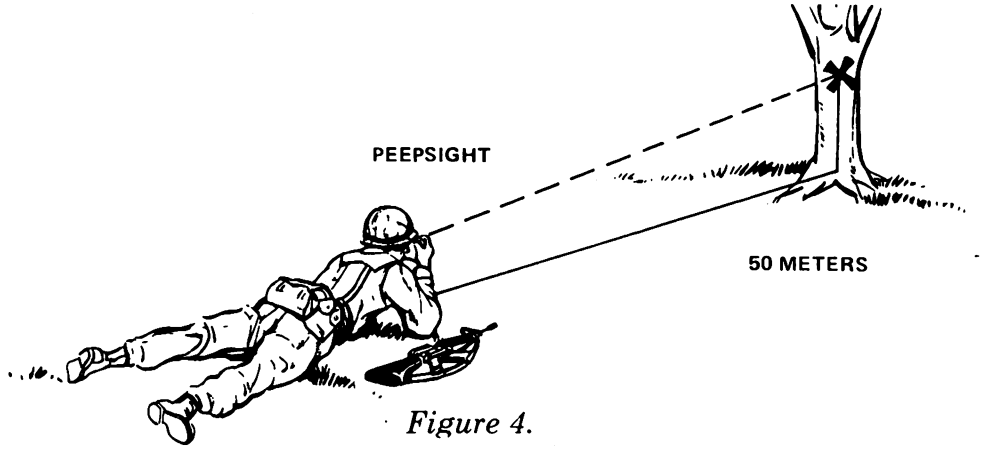
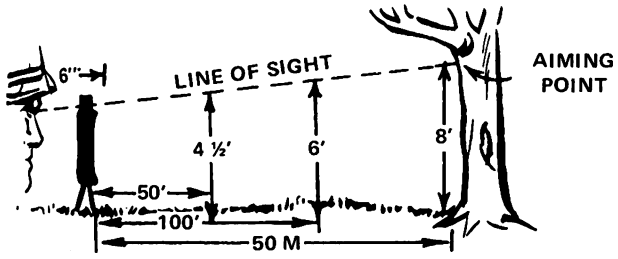


Figure 4.

b. Position the eye about 6 inches to the rear of the sight while sighting through the peepsight. The groove of the sight should be in line with the aiming point. The aiming point should be in the center of the desired area of coverage with the bottom edge of the peepsight parallel to the ground which is to be covered with the fragment spray (figure 5).



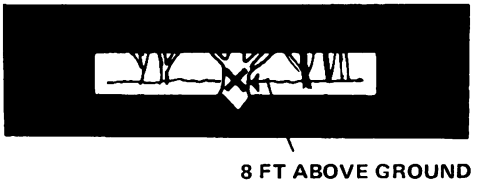


Figure 5.

c. Using the knife-edge sight, select an aiming point at ground level approximately 50 meters (150 feet) in front of the mine (figure 6). Position

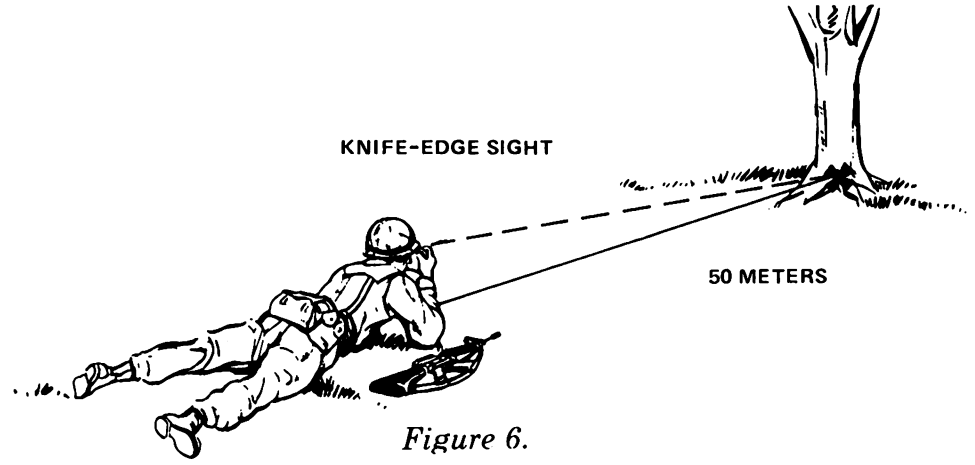


Figure 6.

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the eye approximately 6 inches to the rear of the sight and aline the two edges of the sight with the aiming point (figure 7).

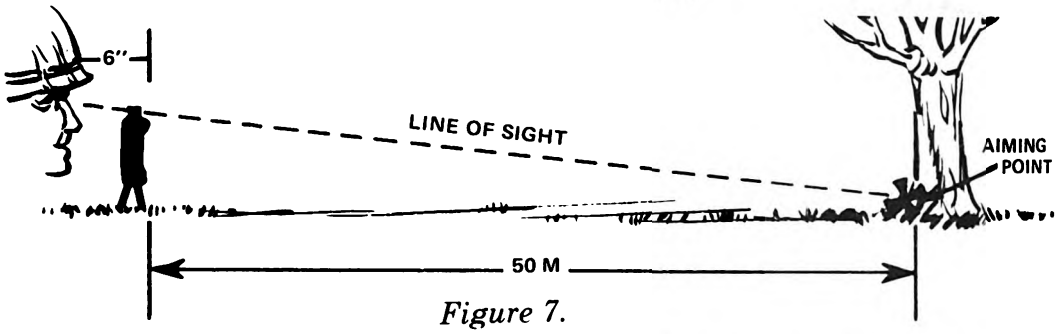

Figure 7.

d. After aiming the mine, secure the firing wire approximately 1 meter to the rear of the mine so it will not become misalined if the firing wire is disturbed.

3. **Testing the Circuit.** To conduct a circuit test, remove the dust cover from the connector of the M57 firing device and from the female connector of the M40 test set. Plug the test set into the firing device (figure 8). Position the firing device bail to the FIRE position and actuate the handle of the firing device with a firm, quick squeeze and observe the window of the test set for a flash of light (figure 8). The flashing light indicates that the M57 firing device and M40 test set are functioning correctly. Remove the shorting plug dust cover from the connector of the firing wire and from the end of the test set. Plug the connector of the firing wire into the test set (figure 9). Place a sandbag over the blasting cap.

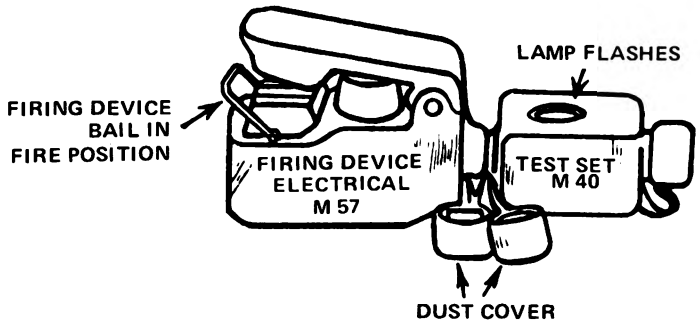

Figure 8.

Place the M57 firing device bail in the fire position and actuate the handle. The lamp in the window of the M40 test set should flash.

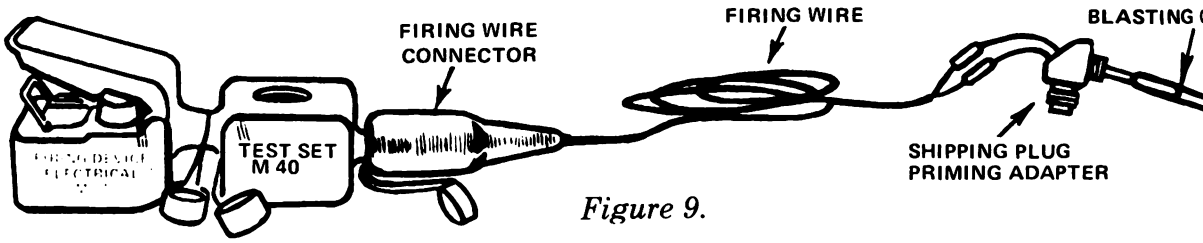

Figure 9.

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NOTE: Circuit testing is conducted without the blasting cap inserted into the detonator well. Insure that no friendly personnel are near the blasting cap, as it may detonate.

4. **Arming the Mine.**

a. After circuit testing, return to the mine (with the firing device in firer's possession) and unscrew one of the shipping plug priming adapters from the mine. Slide the slotted end of the shipping plug priming adapter onto the firing wires of the blasting cap between the crimped connections and the blasting cap. Pull the excess wire through the slotted end of the adapter until the top of the blasting cap is firmly seated in the bottom portion of the shipping plug priming adapter (figure 9). Screw the adapter with blasting cap into the detonator.

WARNING: Make certain that the face of the mine marked "FRONT TOWARD ENEMY" and the arrows on top of the mine point in the direction of the enemy.

b. Recheck the aim of the mine. Camouflage the mine and, if possible, bury the firing wire and move back to the firing position.

NOTE: The firing position should be in a foxhole or covered position at least 16 meters to the rear or the side of the emplaced mine.

c. Prior to connecting the firing device to the firing wire, make certain that the safety bail is in the SAFE position (figure 10) and all friendly troops within 250 meters to the front and sides and 100 meters to the rear of the mine are under cover. **Do not connect the firing device to the firing wire until actual time of firing.**

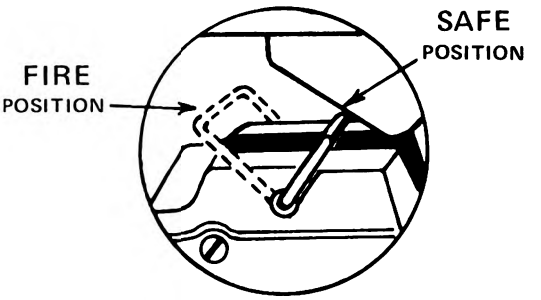

Figure 10.

7. **Firing the Mine.** To fire the mine, remove dust covers from the firing device and firing wire and connect the firing device to the firing wire. When the lead elements of an enemy formation approach within 20 to 30 meters of the mine, position the firing device safety bail in the FIRE position (figure 10) and actuate the firing device handle with a firm, quick squeeze.

8. **Disarming the Mine.** To disarm the mine (if the mine is not detonated), make certain the firing device safety bail is in the SAFE position. Disconnect the firing wire from the firing device and replace dust

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covers. Keep the firing device in your possession throughout recovering the mine. Unscrew and remove the shipping plug primary adapter containing the blasting cap. Separate the two and reverse the shipping plug priming adapter, and screw the plug end of the adapter into the detonator well. Remove the firing wire from the stake and reroll the blasting cap and wire and place in its cardboard container. Remove the mine from its emplacement. Repack the mine and accessories into the bandoleer.

SQT REQUIREMENTS: The soldier is not required to camouflage the mine, or to bury the wire.

REFERENCES:

FM 23-23, Antipersonnel Mine M18A1 (Claymore), C2, Jan 66 (chap 2, sec III, page 2 thru 7)
TEC Lesson 947-071-0106-F, Claymore Mines, Introduction, Circuit Testing and Emplacement
TEC Lesson 947-071-0107-F, Claymore Mines, Electrical Arming and Firing
TEC Lesson 947-071-0109-F, Claymore Mines, Disarming, Recovery and Emergency Destruction Procedures

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TASK NUMBER: 051-192-1021

LOCATE MINES BY VISUAL MEANS

CONDITIONS:

During a daylight movement, with the possibility of enemy mines and boobytraps in an area, using visual sighting means only.

STANDARDS:

Mines will be located so that movement through the area will not detonate any mines.

PERFORMANCE MEASURES:

The following techniques are recommended to detect mines and boobytraps:

1. Do not wear sunglasses.
2. Be alert for tripwires in these places:
   a. Across trails.
   b. On the shoulders of roads at likely ambush sites.
   c. Near known or suspected AT or antivehicle mines.
   d. Across the best route through dense plant growth.
   e. In villages and on roads or paths into them.
   f. In and around likely helicopter landing sites.
   g. In approaches to enemy positions.
   h. At bridges, fords, and ditches.
   i. Across rice paddy dikes.
3. Look for mud smears, grass, sticks, dirt, dung, or other materials on roads.
4. Look for signs of road repair.
5. Watch for disturbed tire marks, ruts, or skid marks.
6. Be alert for any signs placed on trees, posts, or stakes.

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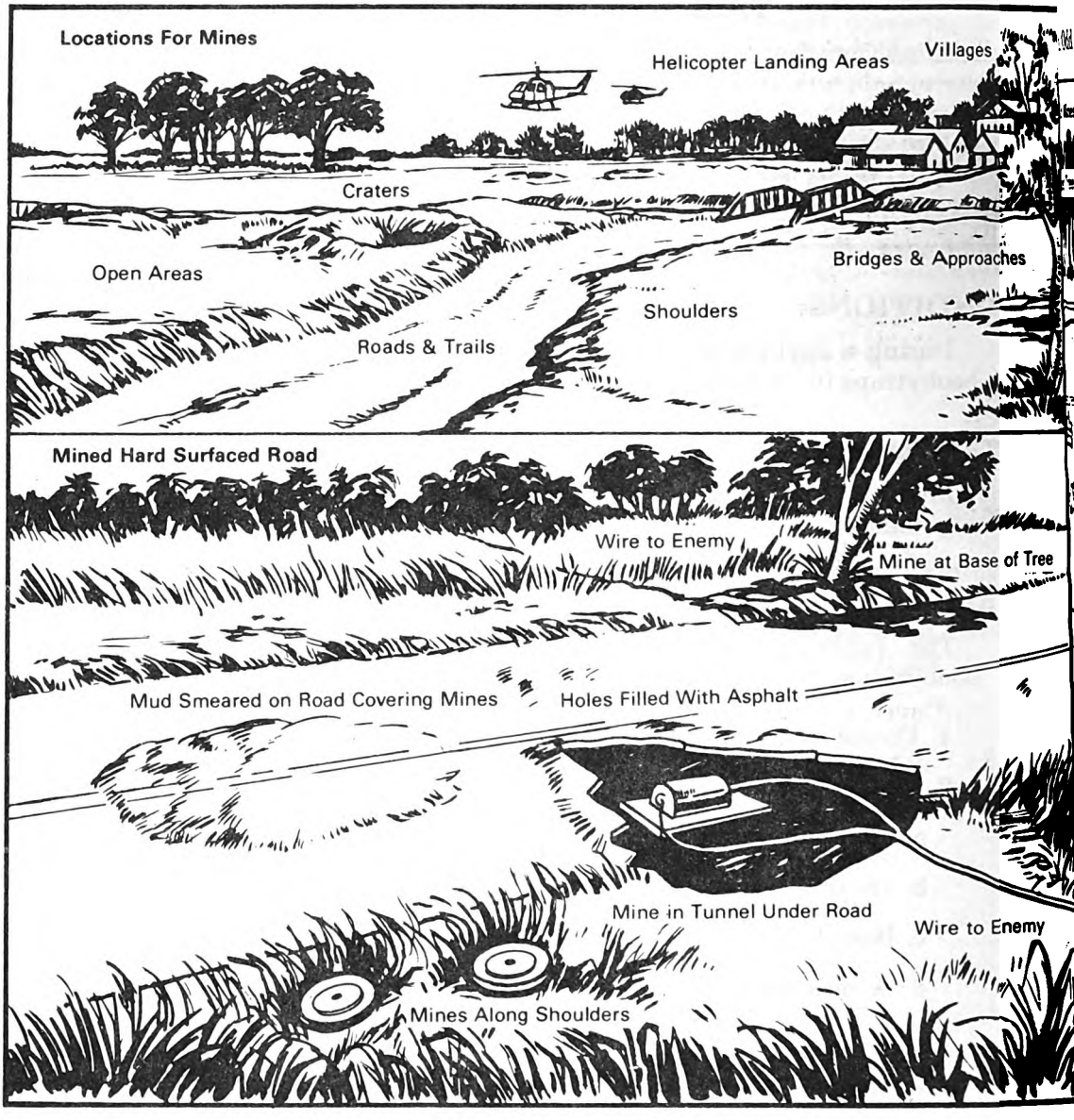

7. Watch for marks other than signs such as:

   a. Sticks or stones placed in a line.

   b. A broken stick placed on a road or trail.

   c. Clumps of grass placed at intervals.

   d. Sticks stuck in the ground.

   e. Strings hanging over doorways.

   f. Wires leading from side of road.

   g. Any odd items in trees, branches, or bushes.

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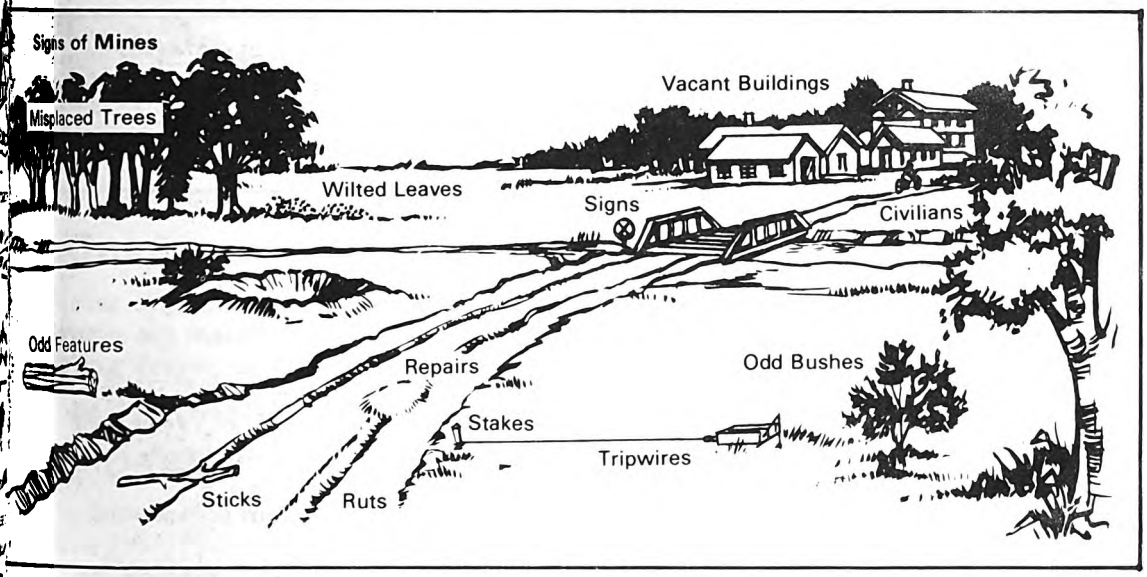
h. Odd features on the ground.



i. Plant growth that has wilted or changed color.

j. Cover washed away by rain from pits and traps.

8. Watch the civilians - where they don't go.

9. Be careful of enemy flags, banners, equipment, or supplies left behind.

10. Watch for pieces of wood or other junk on a road.

REFERENCE:

FM 20-32, Mine/Countermine Operations at the Company Level, Nov 76 (chap 13, sec I, pages 63 thru 66, para 13-2)

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TASK NUMBER: 051-192-1022

LOCATE MINES BY PROBING

CONDITIONS:

Under any environmental conditions, given an area where mines and tripwires are installed, a nonmetallic probe, mine bonnets or other suitable marking device, and an assigned probing direction.

STANDARDS:

Locate and mark all mines without detonation.

PERFORMANCE MEASURES:

Probing is a way of detecting mines by piercing the earth with a sharp nonmetallic object, such as a sharp piece of wood. Metal probes should not be used. Probing is the best way to find buried mines but is slow, careful work, especially in hard or frozen ground.

CAUTION: PRIOR TO PROBING, ITEMS SUCH AS HELMETS, BAYONETS, WEAPONS, AND WEB GEAR SHOULD BE REMOVED AND PLACED TO YOUR REAR. DOG TAGS AND JEWELRY SHOULD BE REMOVED AND PLACED IN EITHER POCKETS OR WEB GEAR PRIOR TO ENTERING, OR UPON BECOMING AWARE OF BEING IN, A MINED AREA. THIS INCREASES YOUR OVERALL SENSE OF TOUCH.

1. How to probe for mines:

a. Roll up sleeves and remove items listed in the caution statement. Move on hands and knees, or crawl. Look and feel upward and forward to find tripwires and pressure prongs.

b. After looking and feeling, probe every 2 inches (5 centimeters) across a 1-meter front. Push the probe gently into the ground at an angle less than 45 degrees from the horizontal, putting just enough pressure on the probe to sink it slowly into the ground.

CAUTION: IF PUSHED STRAIGHT DOWN, THE TIP OF THE PROBE MAY DETONATE A PRESSURE MINE.

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c. If the probe does not go into the ground freely, the soil must be picked or chipped away with the tip of the probe and the loose dirt removed by hand.

d. When a solid object is touched, stop probing and remove the earth to find out what the object is.

e. If a mine is found, remove enough earth to show what type of mine it is, then mark and report its exact location.

2. How to mark mines: During breaching operations where speed and silence are required, detected mines should be clearly marked (by placing a stick with cloth attached near the mine) so that friendly troops can safely bypass them without taking time to remove them.

REFERENCE:

FM 20-32, Mine/Countermine Operations at the Company Level, Nov 76 (chap 13, page 67, para 13-3)

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TASK NUMBER: 051-192-1501

NEUTRALIZE ENEMY MINES

CONDITIONS:

Given a field location with varied terrain, a (dummy) mine(s), 50-meter rope with graphel, 1 pound of C4 or TNT, four blasting caps, 10 meters of time fuse, and incendiary material. Situation requires you to help clear mine(s).

STANDARDS:

The mine(s) will be detonated utilizing the following methods:

1. Hand-placed charges when access to the mine(S) can be gained.

2. Grapnels when engaging trip wire or tilt rod mines.

3. Vegetation fires only as a last resort to breech a minefield and when explosives and graphels are not available.

PERFORMANCE MEASURES:

1. **Mine destruction, removal, and neutralization.**

a. Before a mine is destroyed or removed, traffic will be stopped. All personnel willbe cleared to a safe distance of 300 meters.

b. With standard demolition procedures as referenced in FM 5-25, mines and boobytraps can be destroyed in place. A 1-pound block of TNT or 1-pound block of plastic explosive (C4) placed on top is enough to detonate a mine.

c. IF it is decided that the mine must be removed, specially qualified soldiers should be tasked to remove it. This may be the case when the mine may damage a road, bridge, culvert, or civil structure to excess. Mines of special intelligence value may have to be removed for study instead of being destroyed in place.

d. IF EOD personnel are not available, the mine may be removed by grappling hooks (grapnel) and rope from a protected position.

e. If the mine is detonated, check the crater for other mines. When the crater is clear, measure its size to learn the charge weight of the mine.

f. Safety.

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(1) Flak jackets and steel helmets will be worn, with the exception of mine detector operators.

(2) Only one person will be allowed at the location of a suspected mine.

(3) All mines and explosive devices will be assumed to be equipped with antihandling devices until proven otherwise.

(4) All troops in the area will be cautioned not to run and to move only in areas previously cleared.

g. Personnel in a minefield will:

(1) Not divide responsibility (senior man is responsible for all actions).

(2) Not take chances.

2. **Use of Grapnels (figure 1). This is the safest method of destroying tripwire or tilt rod fuzed mines.**

a. Trip wire and tilt rod fuzed mines can be detonated by throwing a grapnel with rope attached and pulling it back to detonate the mines.

b. A 50-meter rope is attached to the grapnel for handthrowing; throw grapnels and rope past mine.

c. Cover should be sought before grapnel and rope touch the ground in the event that their impact may detonate the mine.

d. Pull grapnel back toward you while remaining in a protected position until the mine is detonated.

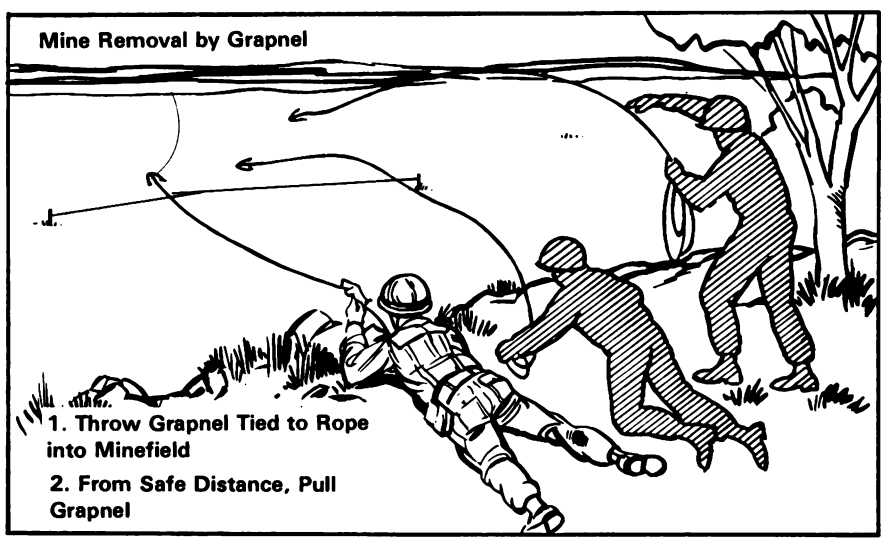

Figure 1.

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NOTE: If the mine does not detonate after pulling it from its emplacement, wait 5 minutes before leaving cover and approaching the mine. The mine should then be destroyed by hand-placed charges.

3. Hand-Placed Charges (figure 2).

a. Procedures for priming demolitions for detonation are contained in tasks:

(1) Prime a demolition block nonelectrically.

(2) Prime a demolition block electrically.

(3) And in FM 5-25, chap 2.

b. A 1-pound charge of TNT, or C4, placed alongside or on top is sufficient to detonate one mine.

c. Prepare charge, and place alongside or on top of mine.

d. Light time fuse and move to safe position.

NOTE: Insure time fuse length will give you adequate time to return to protected position.

Figure 2.

4. Use of Rope (figure 3).

a. Prepare an A-frame and position it near the mine to be detonated.

b. Place a rope throughthe A-frame.

c. Extend the rope to a cleared, covered position, at least 50 meters from the mine.

d. Uncover only enough of the mine to expose a suitable part to which the end of the rope or a grapnel may be attached.

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e. Tie the end of the rope to a hook or projection on the mine. If there is no projection, engage a hook of a grapnel under the bottom side of the mine opposite the direction of pull.

NOTE: Use care not to disturb the mine when uncovering and attaching grapnel or rope to the mine.

f. Move to the covered position and pull the mine from the hole.

NOTE: If no covered position is available, use an armored vehicle (if available) or lie prone behind a stump, tree or log or get in a ditch before attempting to pull the mine from the hole.

g. If the mine does not detonate, wait 5 minutes before leaving cover and approaching the mine. Then check the hole for additional mines.

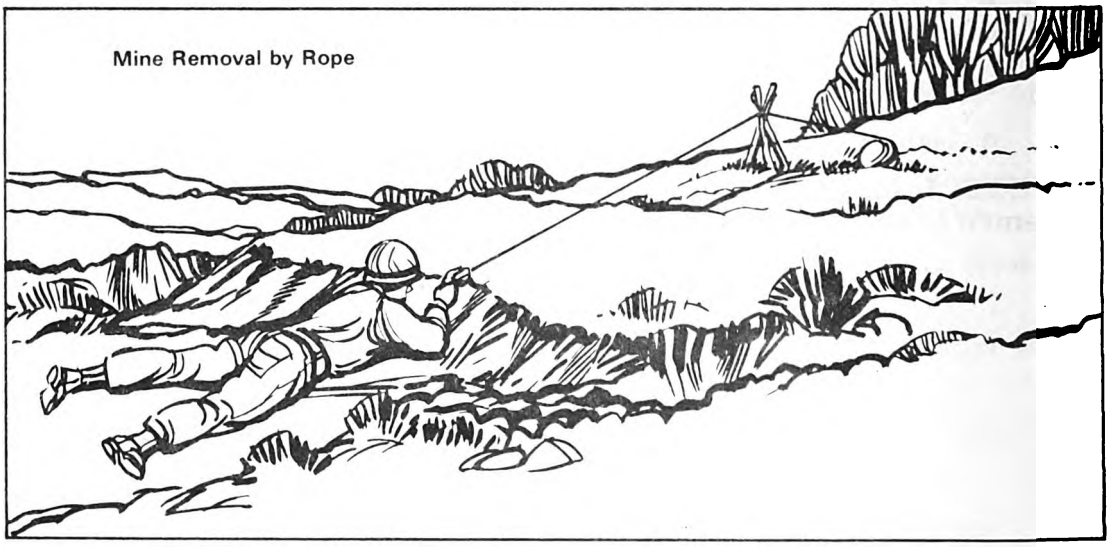

Figure 3.

5. **Detonate by Burning.** Using incendiary material, set fire to the vegetation surrounding a mine (field) from the upwind side.

NOTE: This method is the least recommended method because it may not destroy all mines and those remaining must be located and marked; furthermore, these mines will be highly sensitive.

6. **Use of Weapons Fired Against Mines.** Engage mine from a protected position.

REFERENCES:

FM 5-25, Explosives and Demolitions, Feb 77 (chap 2, page 2-1)
FM 20-32, Mine/Countermine Operations at Company Level, Nov 76 (chap 18, page 99, para 18-8 and 18-10)

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TASK NUMBER: 051-193-1503

CONSTRUCT A NONELECTRIC (INITIATION) DETONATING ASSEMBLY

CONDITIONS:

Under any environmental conditions, with time blasting fuse, nonelectric blasting cap, priming adapter, M60 or M2 weatherproof fuse igniter, and M2 cap crimpers.

STANDARDS:

The detonating assembly will be constructed IAW the performance measures and the nonelectric blasting cap will detonate when fired.

PERFORMANCE MEASURES:

1. Determine the length of time blasting fuse needed.

a. Cut and discard a 6-inch length from the free end of the time blasting fuse to prevent a misfire.

b. Cut a 3-foot length of time blasting fuse to check the burning rate.

(1) Light the fuse end using a fuse igniter, match, or lighter.

(2) Note the time it takes for the fuse to burn.

(3) Compute the burning rate per foot by dividing the time in seconds by the length in feet.

c. Cut the time blasting fuse long enough to permit the person detonating the charge to reach a safe distance by walking at a normal pace before the explosion. This cut should be made squarely across the time fuse.

2. Attach the blasting cap to the time blasting fuse.

a. Take one blasting cap from the cap box. Inspect it by looking into the open end. If any foreign matter or dirt is present, hold it with the open end down, and shake it gently or bump the hand holding it against the other hand.

(1) If foreign matter does not come out, discard cap.

(2) Never tap the cap with a hard object or against a hard object.

(3) Never blow into the cap.

(4) Do not insert anything into the cap to remove any dirt or foreign material.

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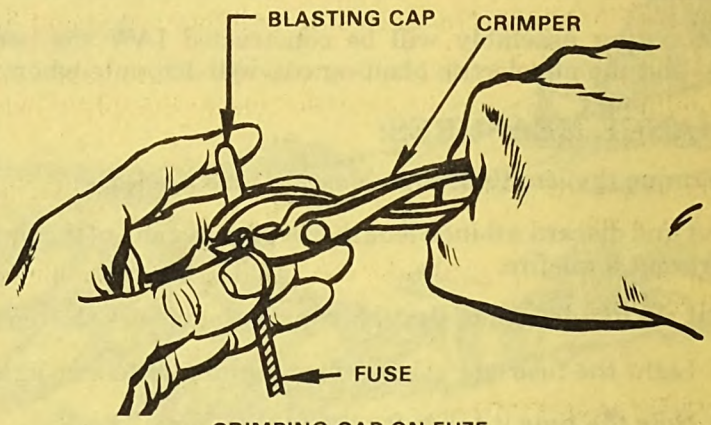
b. Hold the time blasting fuse vertically with the square cut end up and slip the blasting cap gently down over it so that the flash charge in the cap is in contact with the end of the time fuse; if not in contact, it may misfire. Never force the time fuse into the blasting cap by twisting or any other method. If the end is flattened or it is too large to enter the flasting cap freely, roll it between the thumb and fingers until the size is reduced to permit free entry.

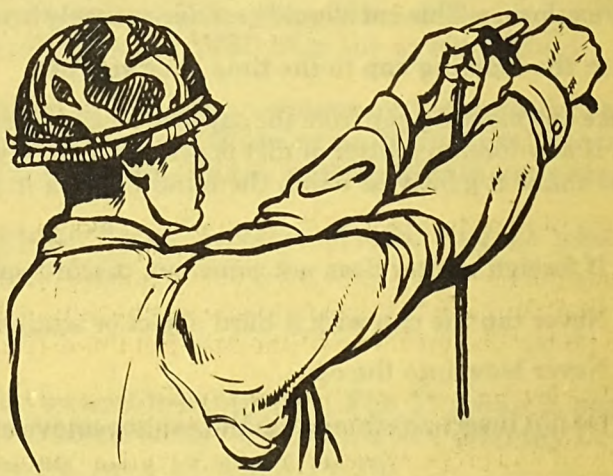
c. After the blasting cap has been seated, grasp the time blasting fuse between the thumb and third finger of the left/right hand and extend the forefinger over the end of the cap to hold it firmly against the end of the time fuse. Keep a slight pressure on the closed end of the cap with the forefinger.

d. Slide the second finger down the outer edge of the blasting cap to guide the crimpers, and thus obtain accurate crimping, even in darkness.



CRIMPING CAP ON FUZE

e. Crimp the blasting cap at a point 1/8 to 1/4 of an inch from the open end. A crimp too near the explosive in the blasting cap may cause detonation. Point the cap out and away from the body during crimping.



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NOTE: If the blasting cap should remain in place several days before firing, protect the joint between the cap and the time blasting fuse with a coating of sealing compound or some similar substance. (As this standard-issue sealing compound does not make a waterproof seal, submerged charges should be fired immediately.)

3. Attach a priming adapter (used when available with a demolition block with threaded cap well).

a. Pass the end of the time blasting fuse through the priming adapter. (The time fuse should move through the adapter easily.)

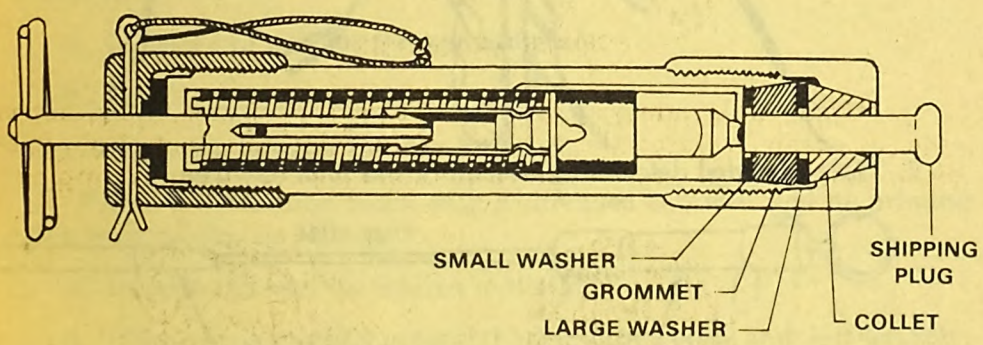
NOTE: For long lengths of time blasting fuse, it may be more convenient to pass the end of the fuse through the priming adapter before crimping the cap onto the time fuse.

4. Attach M60 weatherproof fuse igniter, if one is to be utilized.

a. Unscrew the fuse holder cap two or three turns but do not remove. Press the shipping plug into the igniter to release the split collet, and rotate the plug as it is removed.

b. Insert the free end of the time fuse in place of the plug until it rests against the primer.

c. Tighten the cap sufficiently to hold the fuse in place and thus weatherproof the joint.



M60 weatherproof fuse igniter.

5. Attach M2 weatherproof fuse igniter, if one is to be utilized.

a. Slide the fuse retainer over the end of the fuse, firmly seating it, and apply sealing compound at the joint between the time blasting fuse and the igniter to protect the open end of the fuse from moisture.

b. This device was designed as a positive method of lighting time blasting fuse. It operates effectively under all weather conditions — even under water if it is properly waterproofed. A pull on the striker retaining pin causes the striker to hit the primer, igniting the fuse.

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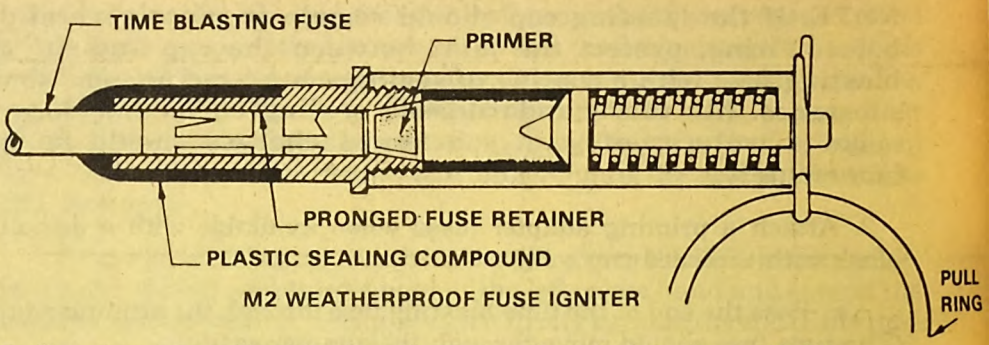
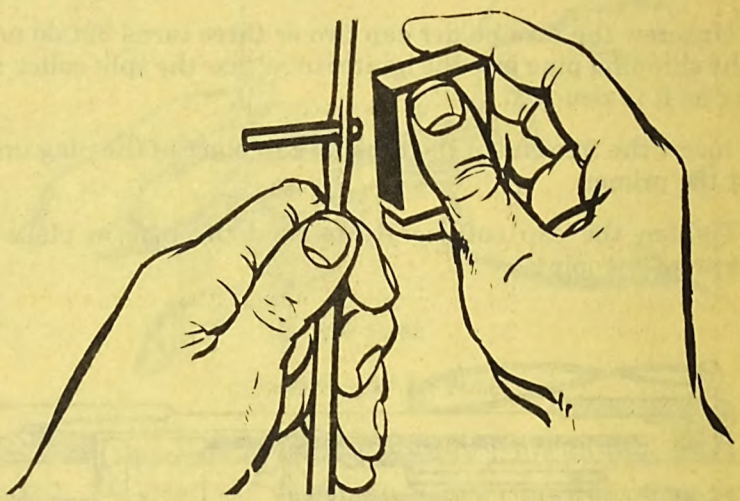
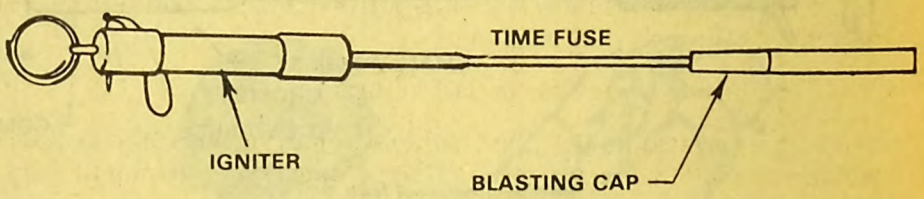


6. Construct expedient igniter if no standard lighter is available.

If a fuse igniter is not available, light the time blasting fuse with a match by splitting the fuse at the end, placing the head of an unlighted match in the powder train, and then light the inserted match head with a flaming match or by rubbing the abrasive on the match box against it.



7. The completed detonating assembly will look like this:



8. Warn personnel of the detonation.

a. A warning will be issued to all personnel in the area to insure safety.

b. The words "Fire in the hole" will be shouted loudly three times as the warning.

REFERENCES:

FM 5-25, Explosives and Demolitions (chap 1, page 1-37, para 1-57m and 1-57n; chap 2, sec I, pages 2-1 thru 2-4)
TEC Lesson 645-093-7320-F, Prepare a Nonelectric Firing System

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TASK NUMBER: 051-193-1003

PRIME A DEMOLITION BLOCK NONELECTRICALLY

CONDITIONS:

Under any environmental conditions, with a completed nonelectric detonating assembly (with and without a priming adapter), demolition blocks (with and without threaded cap well), an M2 crimper, and string.

STANDARDS:

The charge will be primed as follows:

1. Blasting cap will be inspected for foreign material.

2. Blasting cap/time fuse will be securely fastened to the demolition block.

3. The charge will detonate when fired.

PERFORMANCE MEASURES:

1. Prime a demolition block with a threaded cap well and priming adapter available as follows:

a. Inspect cap well for foreign material.

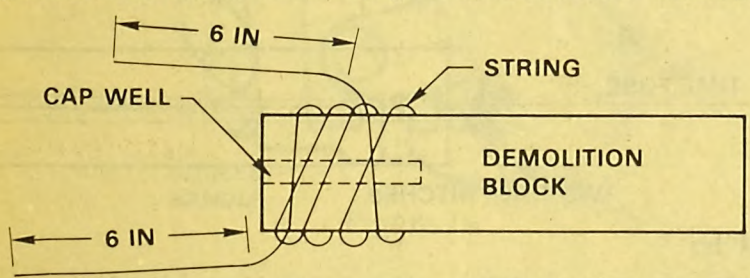
b. Insert cap into cap well.

c. Screw the adapter into the cap well.

2. Prime a demolition block with a threaded cap well and no priming adapter available as follows:

a. Inspect cap well for foreign material.

b. Wrap a string tightly around the demolition block and tie it securely, leaving about 6 inches of loose string on each end after making the tie.



c. Insert a blasting cap with fuse attached into the cap well.

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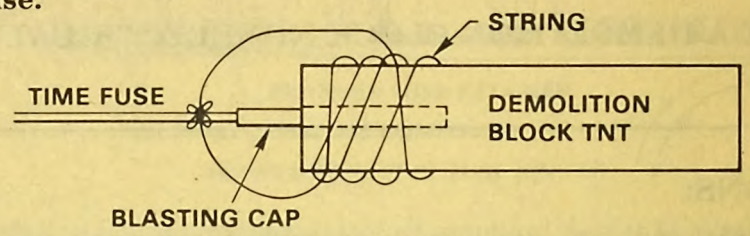
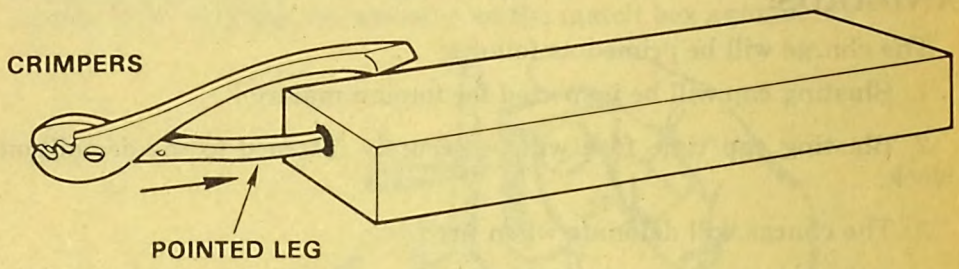
d. Tie the loose string around the fuse to prevent the blasting cap from being separated from the block.

NOTE: Do not tie the string so tight that powder train is broken in the fuse.

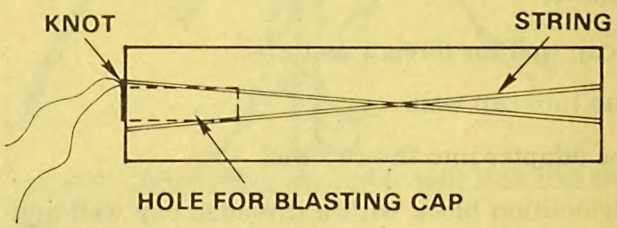


3. Prime a demolition block without threaded cap well as follows:

a. Make a hole in the end of the demolition block with the pointed handle on the M2 crimpers large enough to contain the blasting cap.

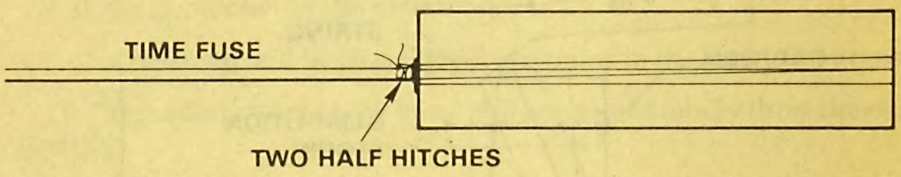


b. Using string, wrap several turns around the block and tie any knot. Position the tie so it will be at the top of the hole when the fused cap is inserted.



c. Insert fused cap into hole. **(NOTE: Never try to force a cap into an expedient cap well that is too small to admit it easily. Remove cap and enlarge hole.)**

d. Tie string around the time fuse at the top of hole with two half hitches.



REFERENCE:

FM 5-25, Explosives and Demolitions, Feb 71 (chap 2, page 2-17, para 2-17)

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TASK NUMBER: 051-193-1004

CONSTRUCT AN ELECTRIC (INITIATION) DETONATING ASSEMBLY

CONDITIONS:

Under any environmental conditions (except for electrical storms, in the vicinity of FM radio transmissions, or other static electricity outputs that could detonate electric blasting caps), with firing wire, electric blasting caps, an M51 blasting cap test set or a blasting galvanometer, and a blasting machine.

STANDARDS:

Construct the detonating assembly IAW the performance measures below in such a manner that the electric blasting cap will detonate when fired.

PERFORMANCE MEASURES:

1. **Check test equipment (M51 blasting cap test set or galvanometer), firing wire, and blasting cap.**

a. To check M51 blasting cap test set, connect the binding posts with a piece of bare wire. The indicator lamp should flash when the handle is squeezed.

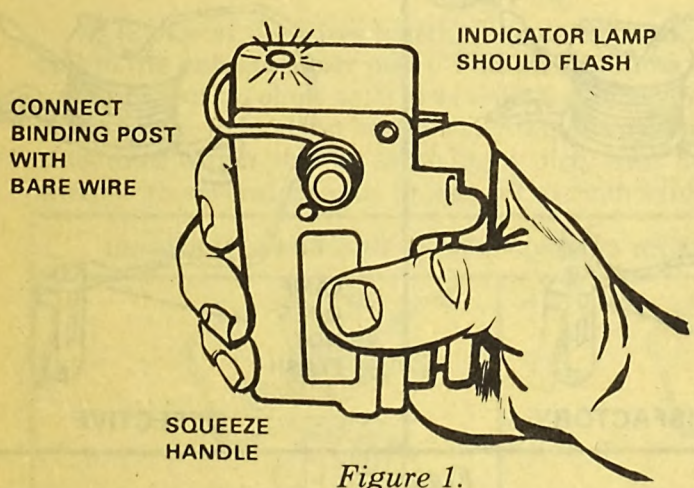

Figure 1.

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b. To check the firing wire (using M51 test set):

(1) Separate the firing wire conductors at both ends, and connect those at one end to the test set binding posts. Actuate test set. The indicator lamp should not flash. If it does, the firing wire has a short circuit (figure 2a).

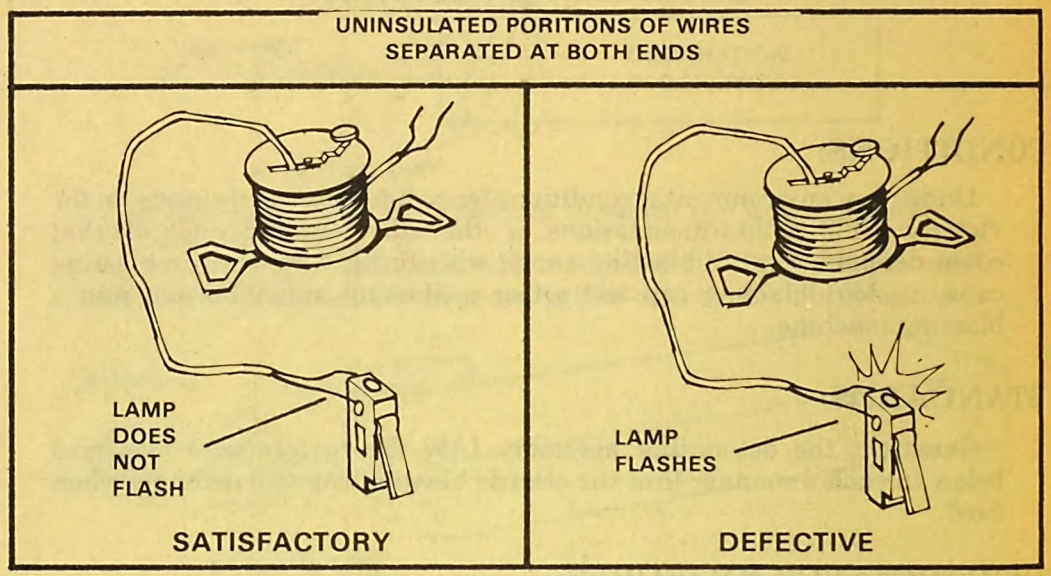

Figure 2a.

(2) Twist the wires together at one end, and connect those at the other end to the test set posts. Actuate test set. The indicator lamp should flash. If it does not flash, the firing wire has a break (figure 2b).

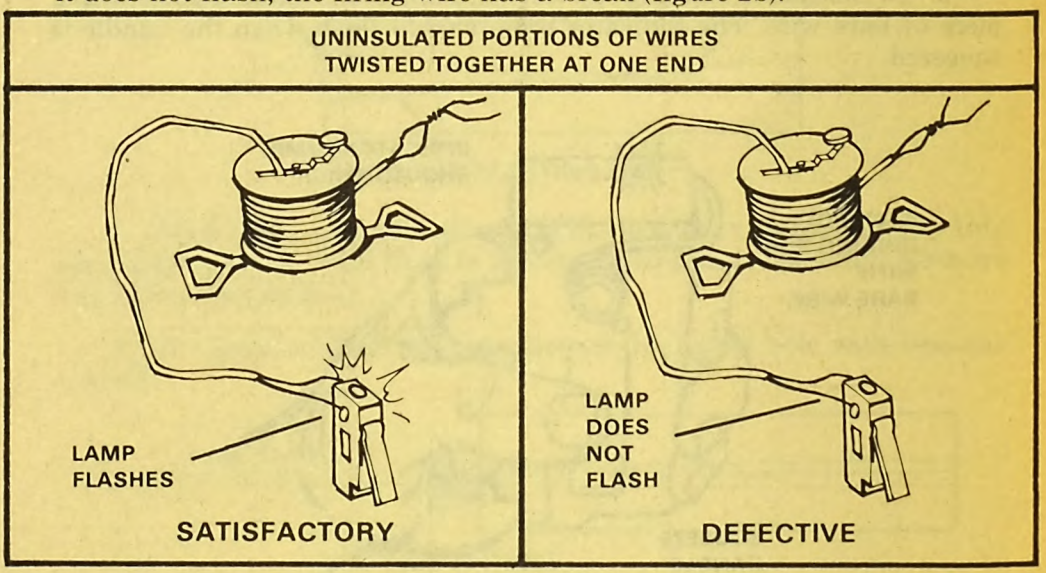

Figure 2b.

c. To check the blasting galvanometer, hold a piece of metal across its terminals. If the battery is good, this should show a wide deflection of the needle, approximately 25 units (zero ohms) (figure 3).

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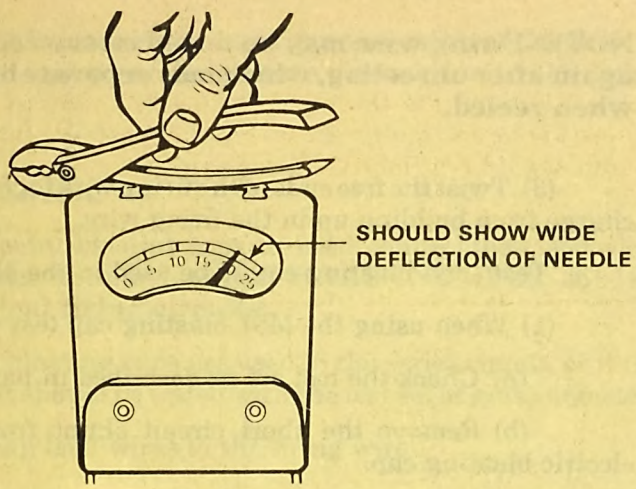

Figure 3.

d. To check the firing wire (using the blasting galvanometer):

(1) Separate the firing wire conductors at both ends, and touch those at one end to the galvanometer posts. The needle should not move. If it does, the firing wire has a short circuit (figure 4a).

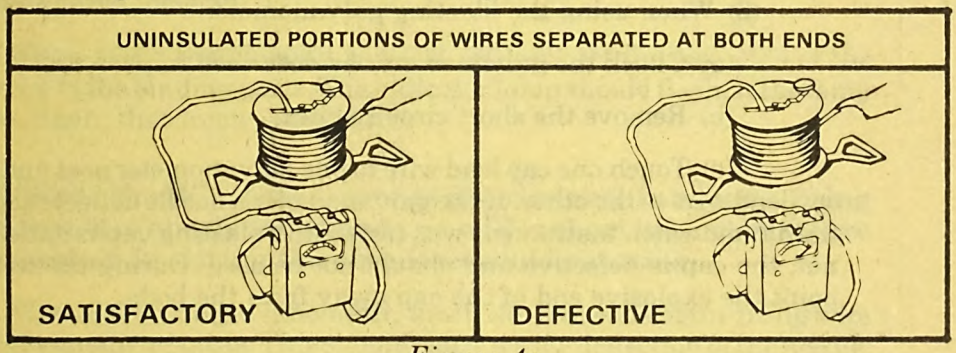

Figure 4a.

(2) Twist the wires together at one end and touch those at the other end to the galvanometer posts. This should cause a wide deflection of the needle (about 1½ ohms or 23 to 24 units for a 500-foot length). No movement of the needle indicates a break; a slight movement indicates a point of high resistance which may be caused by a dirty wire, loose wire connection, or wires with several strands broken off at connections (figure 4b).

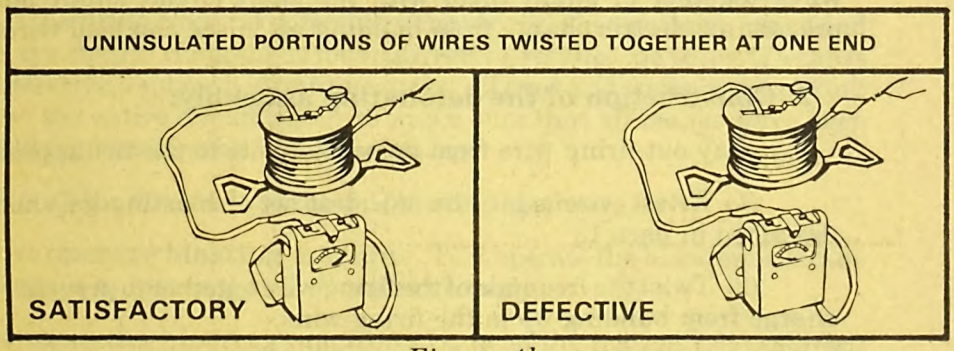

Figure 4b.

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NOTE: Firing wire may be tested on the reel, but should be tested again after unreeling, which may separate broken wires unnoticed when reeled.

(3) Twist the free ends of the firing wire together to prevent an electric charge from building up in the firing wire.

e. Test each blasting cap to be used in the electric firing system.

(1) When using the M51 blasting cap test set:

(a) Check the test set as described in para 1a.

(b) Remove the short circuit shunt from the lead wires of the electric blasting cap.

(c) Attach one cap lead wire to one binding post and tie other cap lead wire to the other post, and squeeze the test set handle. If the indicator lamp flashes, the blasting cap is satisfactory. If it does not flash, the cap is defective and should not be used. During the test, always point the explosive end of the blasting cap away from the body.

(2) When using the blasting galvanometer:

(a) Check the galvanometer as described in para 1c.

(b) Remove the short circuit shunt.

(c) Touch one cap lead wire to one galvanometer post and the other cap lead wire to the other. If the galvanometer's needle deflects slightly less than it did when instrument was tested, the blasting cap is satisfactory; if not, the cap is defective and should not be used. During the test, always point the explosive end of the cap away from the body.

NOTE: If the battery is fresh, the galvanometer should read 25 units (zero ohms) when the instrument is tested and about 24 units (about 2 ohms) when a good blasting cap is tested.

(3) After each cap has been tested, twist the free ends of the cap lead wires together or shunt them with the short circuit shunt provided to prevent an electric charge from building up in the cap lead wires.

2. **Construction of the detonating assembly:**

a. Lay out firing wire from demolition site to the firing position.

(1) Retest wire using the M51 test set or blasting galvanometer as described in para 1.

(2) Twist the free ends of the firing wire together to prevent an electric charge from building up in the firing wire.

b. Move to the demolition pit or site.

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NOTE: Blasting machine should be kept in possession of the firer or in a secure location to prevent premature connection to the firing wire.

3. **Connect series circuit.**

a. If two or more electric blasting caps are used, connect their lead wires into one of the two series circuits described in TASK NUMBER: 051-193-1006, **Connect electrical firing circuits.**

b. If more than 10 blasting caps are used in the series circuit, or if the circuit is complicated, it should be tested with the test set or galvanometer.

c. Splice the free cap lead wires to the firing wire.

4. **Insert caps into charges.** (See TASK NUMBER 051-193-1005, **Prime demolition block electrically.**

5. **Test entire circuit.**

a. Move to the firing position and test the entire firing circuit with the test set or galvanometer.

b. When using the blasting cap test set, connect the free ends of the firing wire to the binding posts. The indicator lamp should flash. If the lamp does not flash, the circuit is defective.

NOTE: Since the M51 test set cannot discriminate between a firing circuit that is properly set up and one with a short in it, special care must be taken in wiring the circuit to avoid shorting.

c. When using the galvanometer, touch the free ends of the firing wire to the galvanometer posts. This should cause a wide deflection of the needle. The magnitude of the deflection depends upon the number of caps and the length of the firing wire. If there is no deflection, the circuit is defective.

NOTE: To get a "wide deflection of the needle," the galvanometer battery should be in good condition.

d. If the firing circuit is defective, shunt wires. Then go down range and recheck the circuit. If a splice is found defective, resplice the wires. If a cap is found defective, replace it. Continue to test all caps and wires in the circuit, then test the entire circuit again to make sure that all breaks have been located before attempting to fire the charge.

e. Twist the free ends of the firing wire together.

6. **Test operate blasting machine.** Test operate the blasting machine several times to insure that it operates properly.

7. **Connect the blasting machine.** Untwist the free ends of the firing wire and fasten them to the two posts of the blasting machine.

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8. **Special precautions.**

a. If two or more electric blasting caps are connected in the same circuit, be sure that they are of the same type and made by the same manufacturer. This is essential to prevent misfires, as blasting caps of different manufacturers have different electrical characteristics which can result in some caps in the circuit not firing because others fire more quickly and thus break the circuit before the slower caps have received enough electricity to fire. This is not true, however, of the M6 special electric blasting caps — all of which are made according to the same specifications. Blasting caps of the same manufacturer may be identified by the label, color of the cap, or shape of the shunt.

REFERENCES:

FM 5-25, Explosives and Demolitions, Feb 71 (chap 2, pages 2-4 thru 2-11, para 2-4 thru 2-9)
TEC Lesson 645-093-7321-F, Prepare Electric Firing System

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TASK NUMBER: 051-193-1005

PRIME DEMOLITION BLOCK ELECTRICALLY

CONDITIONS:

Under any environmental conditions (except for electrical storms, in the vicinity of FM radio transmissions, or other static electricity outputs that could detonate electric blasting caps), with firing wire, tested electric blasting caps, priming adapter, demolition blocks (with and without threaded cap well), and M2 crimper.

STANDARDS:

The charge will be primed IAW performance measures so that it detonates when fired.

PERFORMANCE MEASURES:

1. **To prime a demolition block with a threaded cap well and priming adapter available** (figure 1):

a. Inspect cap well for foreign material.

b. Untwist the free ends of the lead wire and fasten them to the firing wire.

c. Pass the lead wires through the slot of the adapter and pull the cap into place in the adapter.

d. Insert the cap into the cap well of the block and screw the adapter into place.

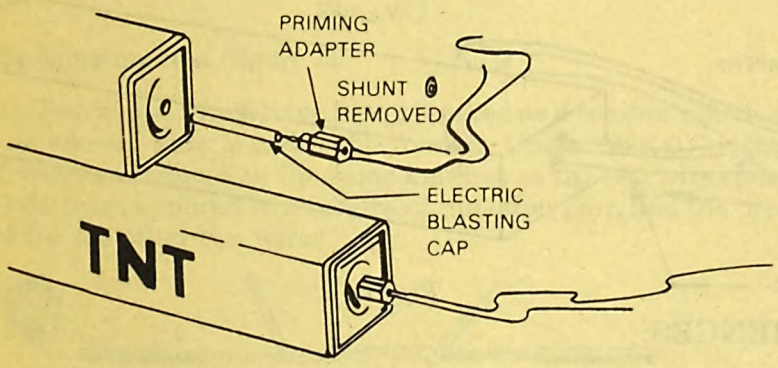

Figure 1.

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2. **To prime a demolition block with a threaded cap well and no priming adapter available** (figure 2):

a. Inspect cap well for foreign material.

b. Untwist the free ends of the lead wire and fasten them to the firing wire.

c. Insert the electric cap into the cap well and tie the lead wires around the block with two half hitches or a girth hitch. Allow some slack in the wires between the blasting cap and the tie to prevent any pull on the blasting cap.

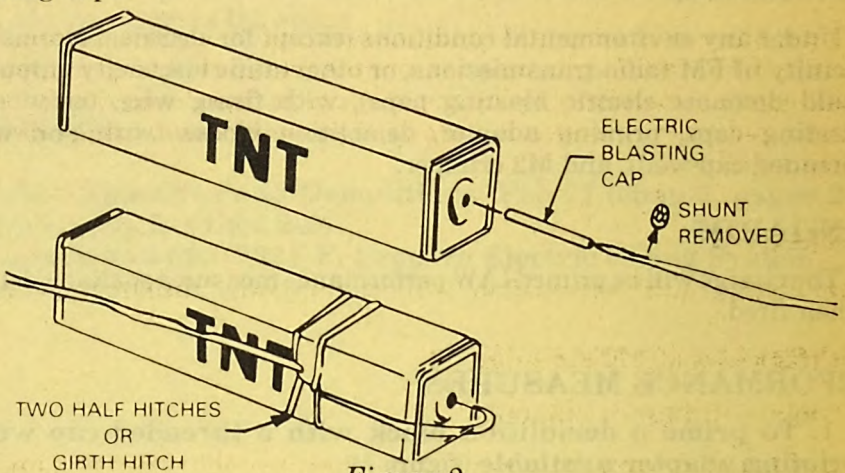

Figure 2.

3. **To prime a demolition block without a threaded cap well** (figure 3):

a. Make a hole in the end of the demolition block with a pointed nonsparking instrument or the pointed handle on the M2 crimpers large enough to contain the blasting cap.

b. Follow steps in performance measure 2. **(NOTE: Never try to force a cap into an expedient cap well that is too small to admit it easily. Remove cap and enlarge hole.)**

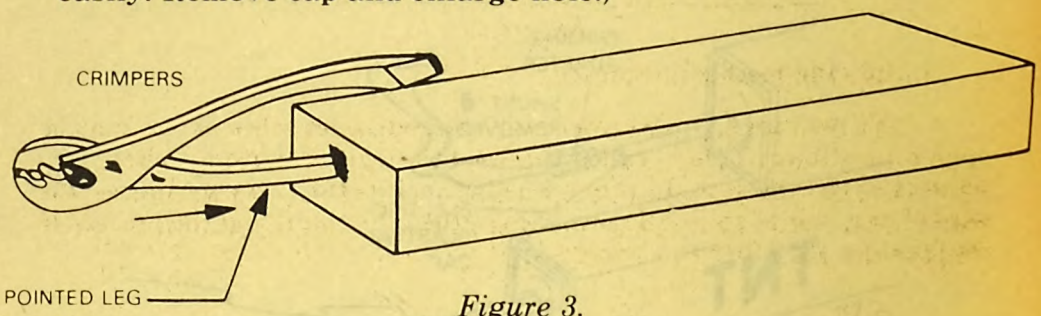

Figure 3.

REFERENCES:

FM 5-25, Explosives and Demolition, Feb 71 (chap 2, page 2-19, para 2-18b)
TEC Lesson 645-093-7321-F, Prepare Electric Firing System

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TASK NUMBER: 051-193-1006

CONNECT ELECTRICAL FIRING CIRCUITS

CONDITIONS:

Under any environmental conditions (except for electrical storms, in the vicinity of FM radio transmissions, or other static electricity outputs that could detonate electric blasting caps), with prepared electrically primed charges and appropriate demolition tools and equipment, using prescribed splicing methods.

STANDARDS:

Every charge in the series circuit will detonate when the circuit is fired.

PERFORMANCE MEASURES:

1. Splice firing wire (figure 1).

a. Insulated wires, before splicing, must have the insulating material stripped from the ends. Expose about 3 inches of bare wire and remove any foreign matter such as enamel by carefully scraping the wire with the back of a knife blade or other suitable tools. The wires should not be nicked, cut, or weakened when the wires are pared, and multiple strand wires should be twisted lightly after scraping.

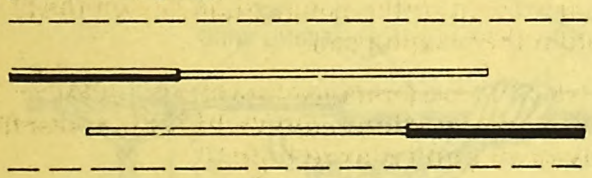

Figure 1.

b. Splicing method (figure 2).

(1) Two wires, which have been prepared as described above, may be spliced as shown. This is called the Western Union "pigtail" splice. Two pairs of wires are spliced in the same manner as the two wire splice. One wire of one pair is spliced to one wire of the other pair, and the process is repeated for the other two wires.

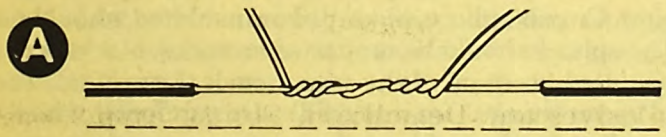

Figure 2.

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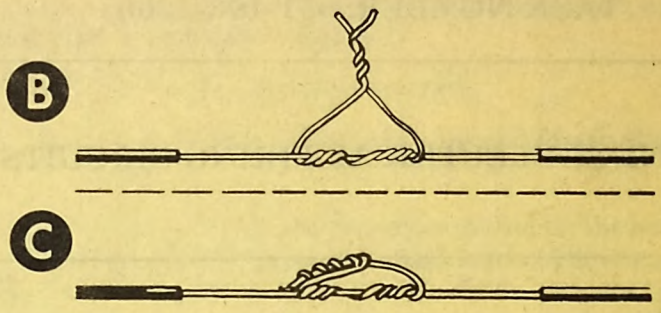

Figure 2 (cont).

Splicing two wires (Western Union "pigtail" splice).

c. A short circuit may very easily occur at a splice if certain precautions are not observed.

(1) If pairs of wires are spliced, stagger the two separate splices and tie with twine or tape (figure 3).

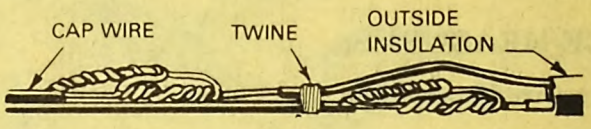

Figure 3.

(2) An alternate method of preventing a short circuit is when the splices are separated, not staggered (figure 4).

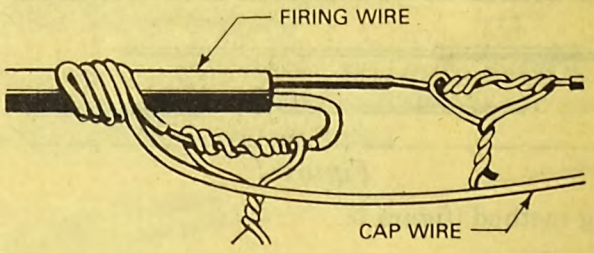

Figure 4.

(3) Whenever possible, insulate splices from the ground or other conductors by wrapping them with friction tape or other electrical insulating tape. This is particularly necessary when splices are placed under wet tamping. Circuit splices, not taped or insulated, should not lie on moist ground. The splices should be supported on rocks, blocks, or sticks so that only the insulated portions of the wires touch the ground. They may also be protected by inserting them into cardboard cap spools which may be bent to hold the splice firmly inside.

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(4) Splices may be protected from damage from pull by tying the ends in an overhand or square knot, allowing sufficient length for each splice (figure 5).

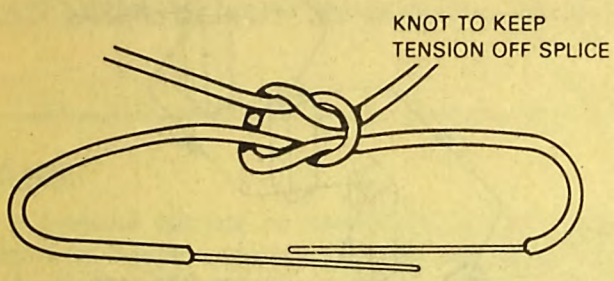

Figure 5.

Specific Reference: FM 5-25, chap 2, para 2-5, fig 2-5, 2-6.

d. Series circuits (figure 6).

(1) Common series is used for connecting two or more charges fired electrically by a single blasting machine. A common series circuit is prepared by connecting one blasting cap lead wire from the first charge to one lead wire in the second charge and so on until only two end wires are free, then connecting the free ends of the cap lead wires to the ends of firing wire. Connecting wires (usually annunciator wire) are used when the distance between blasting caps is greater than the length of the usual cap lead wires (figure 6a).

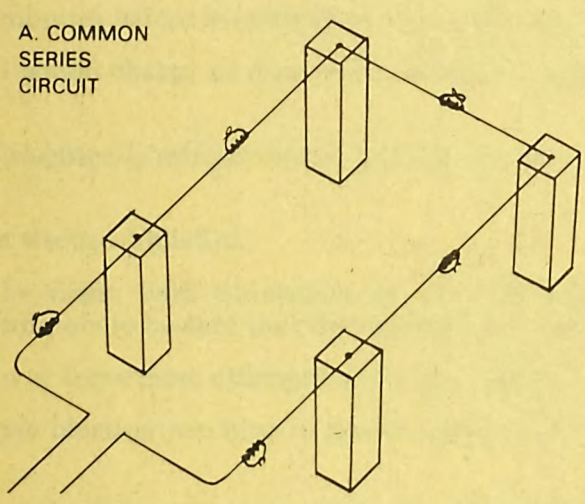

Figure 6a.

(2) Leapfrog series is useful for firing ditching charges or any long line of charges. It consists of omitting alternate charges on the way and then connecting them to form a return path for the electric impulse to reach the other lead by the firing wire. This brings both end wires out at the same end of the line of charges, and thus eliminates laying a long return lead from the far end of the line of charges back to the firing wire (figure 6b).

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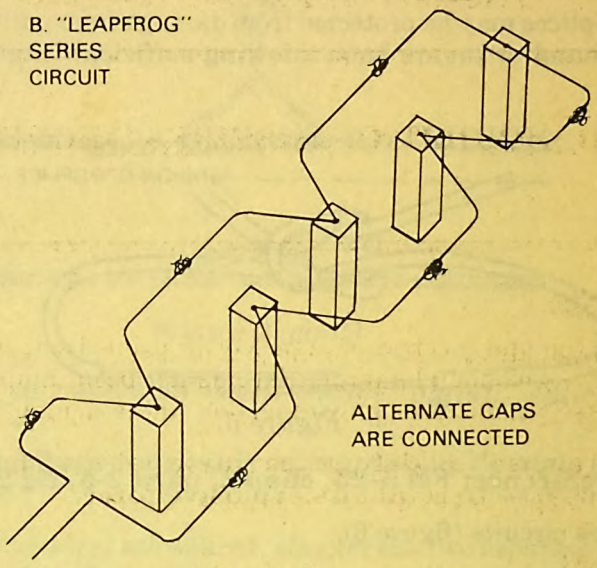

Figure 6b.

Specific Reference: FM 5-25, chap 2, para 2-6, fig 2-7.

REFERENCE:

FM 5-25, Explosives and Demolitions, Feb 71 (chap 2, pages 2-6 thru 2-7, para 2-5 and 2-6)

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TASK NUMBER: 051-193-1502

CLEAR DEMOLITION MISFIRES (ABOVE GROUND)

CONDITIONS:

Given a 1-pound electric or nonelectric primed charge; an electric or nonelectric 1- or 2-pound charge that has not been tamped, located above ground; blasting machine; galvanometer; and a demolition pit.

NOTE: "Tamped" is defined as: material that has been packed around a charge to retain its explosive force.

STANDARDS:

Misfires will be cleared in accordance with applicable performance measures below to prevent premature detonation of the misfired demolition charge.

PERFORMANCE MEASURES:

1. To clear a nonelectric misfire:

a. Wait 30 minutes before investigating the cause of the misfire.

b. Place a 1-pound charge as close to the misfire as possible without disturbing it.

c. For a nonelectrically primed charge, light the time fuse and move to a safe area.

2. To clear an electrical misfire:

a. Check the firing wire connection to the blasting machine or power-source terminals to be sure that the contacts are good.

b. Make two or three more attempts to fire the circuits.

c. Change the blasting machine or power source and attempt to fire again.

d. Disconnect the firing wires (shunt the wires to avoid possible static electric detonation) and investigate immediately.

e. Check the entire circuit, including the firing wire, for breaks and short circuits.

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f. Place a new 1-pound electrically primed charge as close to the misfire as possible.

g. Move back to the firing position and fire the charge.

REFERENCE:

FM 5-25, Explosives and Demolitions, Feb 71 (chap 2, sec I & II, page 2-1)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION IV
FORWARD OBSERVER PROCEDURES

TASK SUMMARIES

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TASK NUMBER: 061-283-6002

LOCATE A TARGET BY SHIFT FROM A KNOWN POINT

CONDITIONS:

You will be given binoculars (if available), a compass, a pencil, and a 1:50,000 scale military map of the target area. You have identified a suspected target near a point known by you to include direction and plotted in the fire direction center (FDC). Your own location is plotted on your map.

STANDARDS:

Locate the target within 250 meters of the actual location. Announce target location within 90 seconds after identification. Express direction to the nearest 10 mils and within 100 mils of actual direction. Express right or left corrections to the nearest 10 meters. Express range corrections to the nearest 100 meters.

PERFORMANCE MEASURES:

Definitions:

1. **Deviation** - The distance in mils or meters a target is right or left of a known point or the distance in mils or meters a round bursts right or left of the target.

2. **Lateral shift** - The correction in meters the FO sends to the FDC to bring the mortar or artillery rounds onto the observer target (OT) line.

3. **Range correction** - The correction in meters the FO sends to the FDC to hit, bracket, or creep the mortar or artillery round onto the target for range.

4. **OT factor** - The known or estimated distance to a target or known point expressed in thousands (2500 meters would be expressed as 2.5) and used to convert the mils between two points to meters (lateral shift).

1. Determine observer-target (OT) direction.

a. Measuring deviation from a known point to the target.

(1) By binoculars: In looking through binoculars you will find a mil scale which is used to measure horizontal distance (figure 1). This scale is divided into 10-mil increments, with 100 mils across the scale. Let's say Hill 905 in figure 2 is your known point. You measure the deviation from Hill 905 to the target. The deviation is three 10-mil increments, or 30 mils right of Hill 905.

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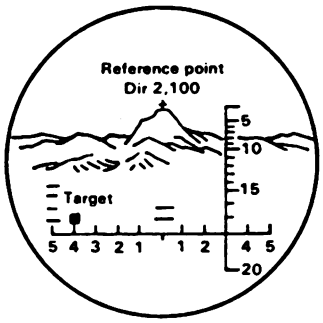

Figure 1.

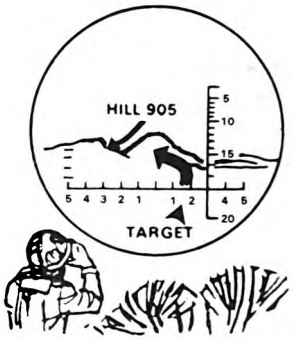

Figure 2.

(2) By the hand-and-finger method:

(a) If you do not have binoculars, you can use your hand and fingers to measure how many mils right or left of the known point the target is. One finger is about 30 mils; two fingers, 70 mils; and three fingers, 100 mils. See figure 3 for approximate hand and finger values. To use this method, with your arm fully extended, count the number of fingers it takes to cover the distance from the known point to the target. Then again referring to figure 3 you have a good approximation of the deviation. Using the same known point, Hill 905, and the same target, let's use fingers to measure the deviation (see figure 4). Extending the arm fully, you find the target one finger to the right of Hill 905. Recall that one finger is about 30 mils.

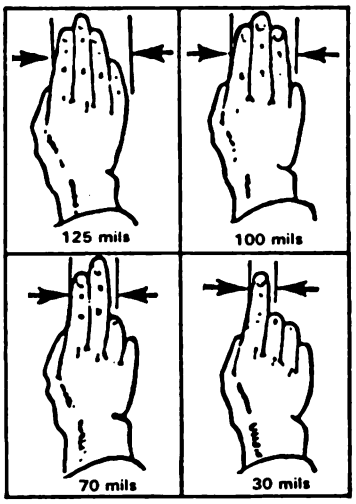

Figure 3.

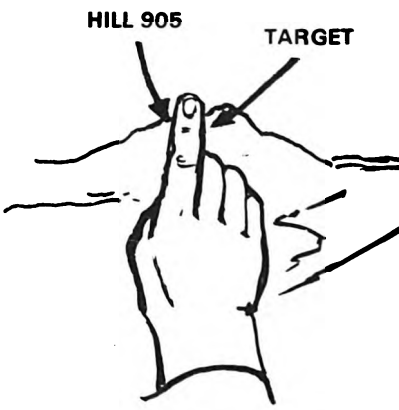

Figure 4.

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(b) If degrees are being used, remember: 17.8 mils equals 1 degree. As a general guideline, you can equate mils and degrees by using the relationship 35 mils equals 2 degrees. The field artillery and mortars, however, would prefer measurement in mils. If it becomes necessary to use degrees, be sure you tell the FDC. Remember, your compass will measure mils as well as degrees.

b. Applying deviation. Apply the measured deviation to the known direction (if the target is right of the known point, add deviation; if the target is left of the known point, subtract the deviation).

NOTE: An easy way to remember this is the RALS rule: right-ADD-left-SUBTRACT.

(1) Right Deviations - Add. In figure 2, we know the direction to Hill 905 to be 3200 mils. With the binoculars, we measure the deviation to be 30 mils. Since the target is right of the known point we add the deviation (30 mils) to the known direction (3200 mils). The sum is the direction to the target (3230 mils).

3200 (direction to known point)
+30 (right deviation - add)
3230 (direction to the target)

(2) Left Deviations - Subtract. In figure 1, we know the direction to the reference point (2100 mils). With the binoculars, we measure the deviation to be 40 mils. Since the target is left of the known point, we subtract the deviation (40 mils) from the known direction (2100 mils). The answer (2060 mils) is the direction to the target.

2100 (direction to known point)
-40 (left deviation - subtract)
2060 (direction to the target)

2. Determine the lateral shift from a known point to the target (see figure 5) using the mil relation formula.

a. The formula is expressed as $\frac{W}{Rm} = 1$, where m is the angular measurement in mils between the two points, R is the distance in thousands of meters (expressed to the nearest 100) to the known points from which the angle (m) was measured (figure 5), and W is the lateral distance in meters.

b. A convenient way of using the mil relation formula is to cover the value desired and perform the calculation indicated. For example, to find the lateral shift in meters, the lateral distance (W) would be covered leaving the range (R) to be multiplied by the mils (m).

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(1) For our purposes, the mil relation formula is used in conjunction with the distance to the known point expressed in thousands to the nearest 100 to determine lateral shift. The lateral shift in meters (W) is equal to the distance to the known point (R) times the angular deviation in mils (m̸).

(2) the distance to the known point is the distance from the observer to the known point (to the nearest 100 meters) divided by 1000. For example, if the distance to the known point (church in figure 5) is estimated to be 3,200 meters, the distance to the known point is 3.2.

$$\frac{3200}{1000} = 3.2$$

(3) Now we are ready to determine the lateral shift. We multiply the distance to the known point (3.2) by the angular deviation (30 mils); the product is the lateral shift (96 meters).

3.2 (R)
× 30 (m̸)
96 (Lateral shift) R 100 (W)

Since the deviation is to the right, expressed to the nearest 10 meters, we shift Right 100.

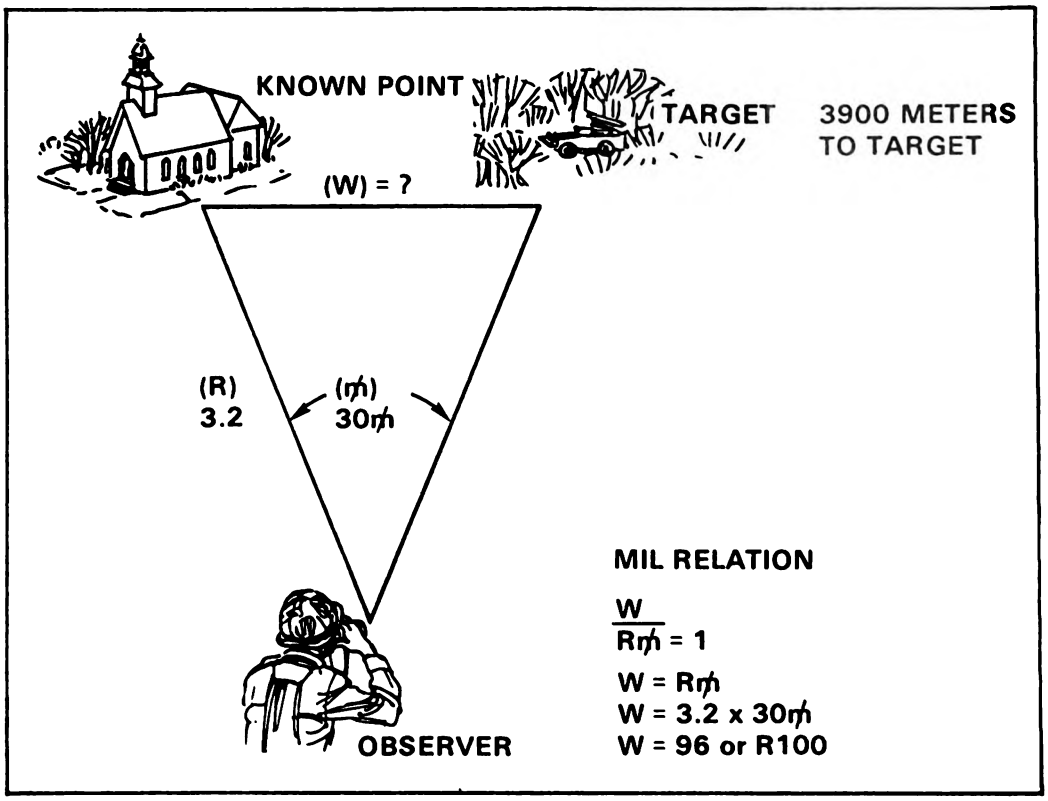

Figure 5.

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3. Determine range change from the known point to the target (see figure 5).

a. The range change is estimated to the nearest 100 meters. If the target is beyond the known point, we add the range difference. If the target is closer than the known point, we drop the difference.

b. For example, if the distance to the known point is 3200 meters and the estimated distance to the target is 3900 meters, the range change is 700 meters (3900 - 3200 = 700). Since the target is beyond the known point, we add 700. If the target distance is estimated at 2800 meters, the range change is 400 meters (3200 - 2800 = 400). Since the target is closer than the known point, we drop 400.

NOTE: Task 071-329-1010, Determine an azimuth, must be mastered as a prerequisite to this task.

REFERENCES:

TC 6-40-4, Fire for Effect, Mar 77 (part 1, page 8, 10-17)
TEC Lesson 949-061-0001F, Determination of Direction
TEC Lesson 949-061-0003F, Locate a Target by Shift from a Known Point

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TASK NUMBER: 061-283-6003

CALL FOR/ADJUST INDIRECT FIRE

CONDITIONS:

You will be given binoculars (if available), a radio, callsigns for fire direction center (FDC), a compass, a coordinate scale, a pencil, and a 1:50,000 scale military map of the target area (targets may vary in range up to 4,000 meters).

STANDARDS:

The initial request for fire must be made within 3 minutes after the target has been designated. Adjustments must be transmitted within 30 seconds after round impacts. Observer must achieve effect on the target within five adjustments. **(NOTE: Round must impact within 50 meters of the target to achieve effect on the target.)**

PERFORMANCE MEASURES:

1. Formulate and transmit the initial call for fire.

a. Locate the target by grid coordinate, shift from a known point, or polar plot.

b. Determine the direction from your position to the target.

c. Transmit the call for fire to the FDC on the FDC net. Include the following elements in sequence:

(1) Observer identification. (Your callsign)

(2) Warning order. (Adjust fire)

(3) Location of target. (Grid or shift data)

(4) Description of target. (What is the target? Platoon in the open . . .)

(5) Method of engagement (may be omitted if area fire is desired). **(NOTE: If target is within 600 meters of friendly troops, announce "Danger close.")**

(6) Method of fire and control.

The initial fire request for a mission using shift from a known point would be somewhat like example 1. The request for a grid mission would approximate example 2.

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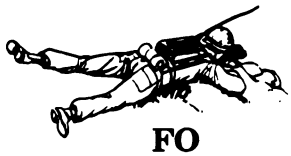
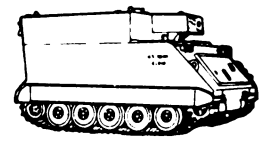


FO



FDC

INITIAL FIRE REQUEST

"H66, THIS IS H44, ADJUST FIRE, SHIFT 732, OVER."

"DIRECTION 5210, LEFT 380, ADD 400, OVER."

"COMBAT OP IN OPEN, VT, OVER."

"CHARLIE, ONE ROUND, OUT."

"THIS IS H66, ADJUST FIRE, SHIFT 732, OUT."

"DIRECTION 5210, LEFT 380, ADD 400, OUT."

"COMBAT OP IN OPEN, VT, OUT."

Message to Observer

"CHARLIE, ONE ROUND, OVER."

Example 1.

YOU | **FDC**

INITIAL FIRE REQUEST

"A4Z57, THIS IS G3H71, ADJUST FIRE, OVER."

"G3H71, THIS IS A4Z57, ADJUST FIRE, OUT."

"GRID 180513, OVER."

"GRID 180513, OUT."

"INFANTRY PLATOON IN THE OPEN, VT IN EFFECT, OVER."

"INFANTRY PLATOON IN THE OPEN, VT IN EFFECT, OVER."

MESSAGE TO OBSERVER

"BRAVO, TWO ROUNDS, OVER."

"BRAVO, TWO ROUNDS, OUT."

DIRECTION (MUST BE SENT BEFORE OR WITH YOUR FIRST CORRECTION)

"DIRECTION 1650, OVER."

"DIRECTION 1650, OUT."

Example 2.

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2. Adjust fire onto the target using the bracketing method of adjustment. (See figure 1.)

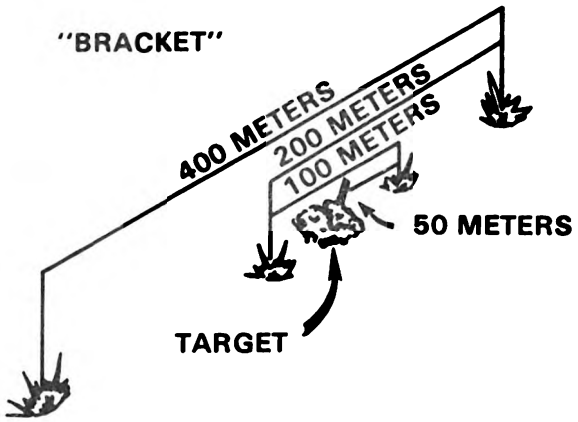

Figure 1.

a. Spot each round when it impacts as over or short, right or left of your target.

(1) When the first range spotting is observed, make a range correction that would result in a range spotting in the opposite direction; e.g., if the first round is short, add enough to get an over on the next round.

(2) Use the following guide to establish a bracket.

Round impact from target	Add or drop
Over 400 meters	+ or - 800 meters
200-400 meters	+ or - 400 meters
100-200 meters	+ or - 200 meters
less than 100 meters	- or - 100 meters

(3) Deviation.

(a) Measure the horizontal angle in mils, using either fingers or the reticle pattern in the binoculars (see figures 2 and 3). Estimate the range to the target and divide by 1000. This is the OT factor. If the OT distance is 1000 meters or greater, the OT factor is expressed to the nearest whole number. If the OT distance is less than 1000 meters, the OT factor is expressed to nearest 1/10th, e.g., 800 = .8. Multiplying the OT factor by the deviation measured in mils produces deviation in meters.

(b) For example, in figure 2 we measure the round 100 mils right of the target. Estimating the range to be 2,200 meters, the OT factor is 2.2. For adjustment purposes, we express the OT factor to the nearest whole number. Example: 1.1 would be 1; 1.8 would be 2; 2.5 would be 3. Multiplying the angle (100 mils) by the OT factor (2), we get the deviation in meters (200 meters right).

100 (deviation in mils)
× 2 (OT factor)
200 (deviation in meters)

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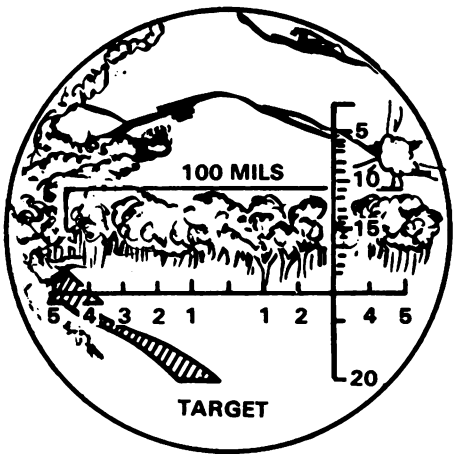


Figure 2.

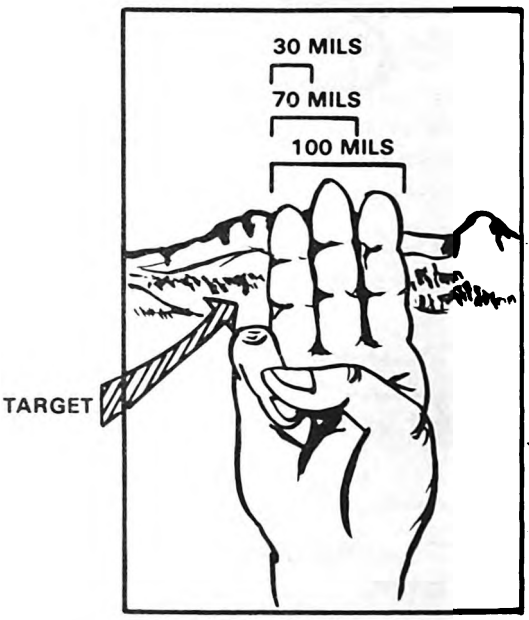
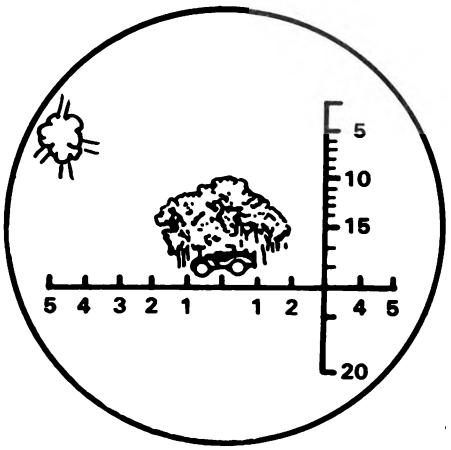


Figure 3.

b. Transmit corrections to the FDC in meters. The initial correction should bracket the target in range. Deviation corrections should be made to keep the rounds on line. Figure 4 shows the impact of your initial round. Since the round is beyond the target, you must drop. You estimate that the round is 250 meters beyond the target. Therefore, a 400-meter drop will give you a bracket.

The round impacted 50 mils left of the target. With an OT factor of 2, the round impacted 100 meters left. Your correction to FDC is "Right 100, Drop 400, Over."



(MILS) X (OT) = (SHIFT)
50 X 2 = 100 METERS
"RIGHT 100, DROP 400, OVER"

Figure 4.

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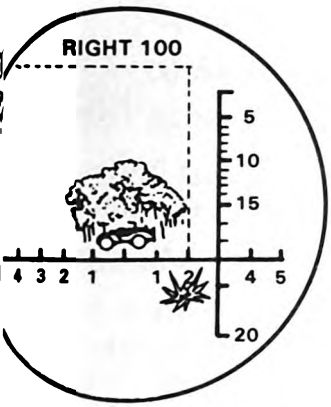
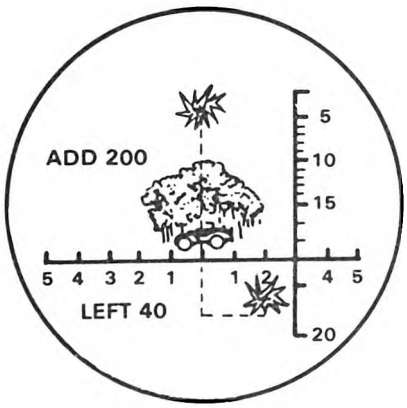
c. Continue splitting the range bracket until a 100-meter bracket is split or a range correct sensing is observed, maintaining deviation on line. Figures 5, 6, and 7 show the next three adjustments. Note that each deviation correction is made to keep the impacting rounds on line. The range corrections split the bracket each time. The adjustment phase of a fire mission would resemble example 3.



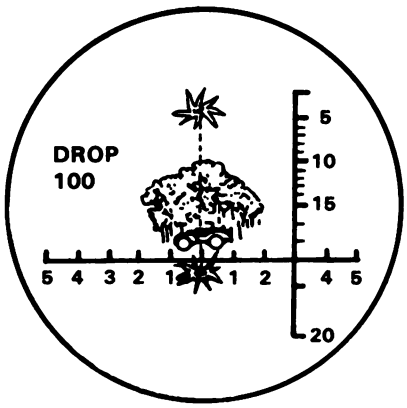
"LEFT 40, ADD 200, OVER"

Figure 5.



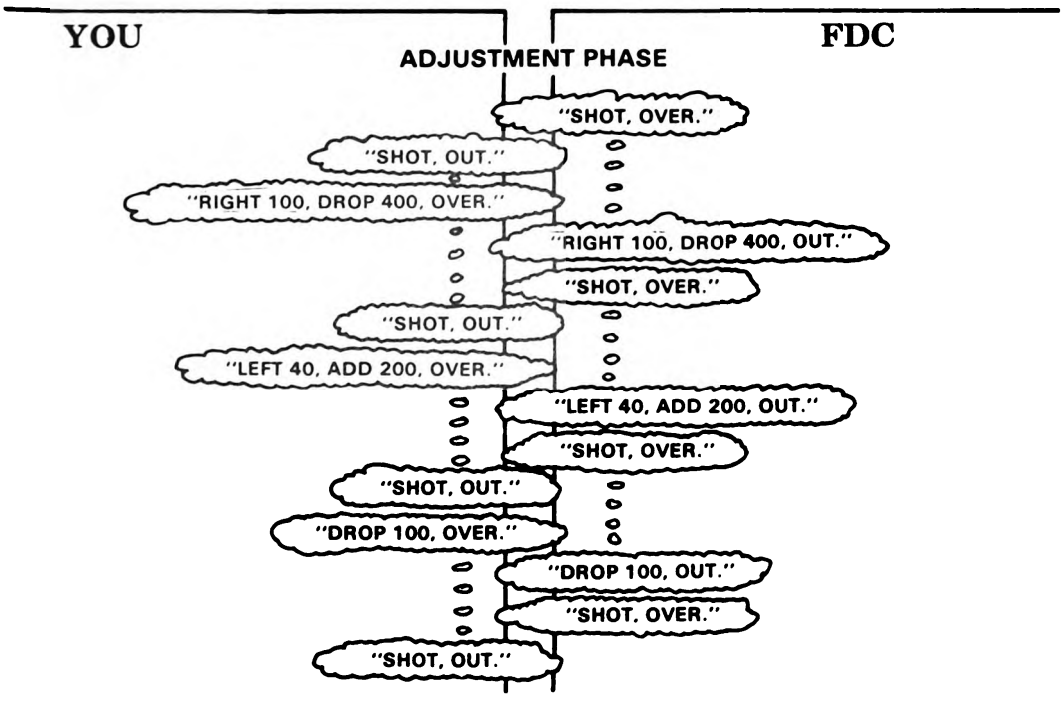
"DROP 100, OVER"

Figure 6.



"ADD 50, FIRE FOR EFFECT, OVER"

Figure 7.



Example 3.

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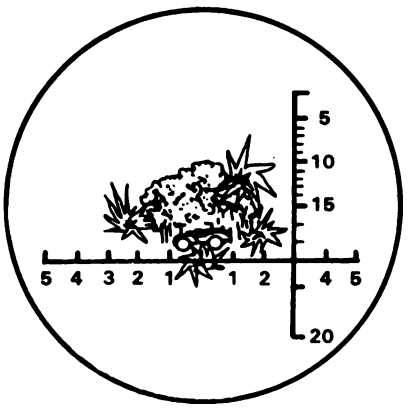
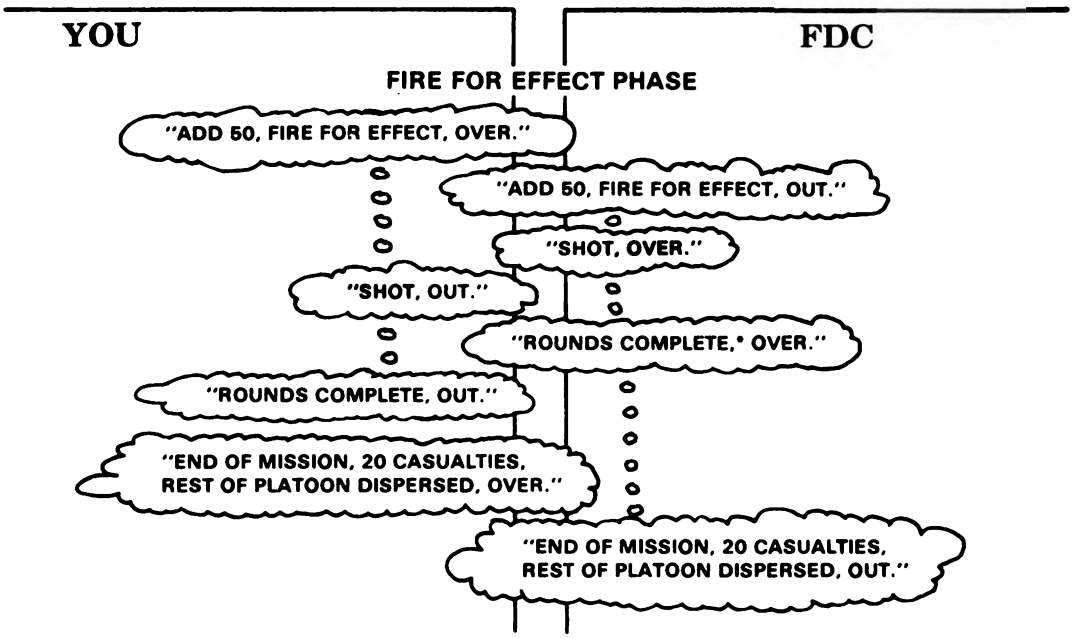
d. Initiate fire for effect. When a 100-meter bracket is split or a range correct spotting is made, the fire-for-effect phase is entered. Note that figure 7 shows the 100-meter bracket split and the call is **fire** for effect. Figure 8 shows a simulated pattern which might be observed in the fire-for-effect phase. (See example 4.)



"END OF MISSION"

Figure 8.


YOU
FDC
FIRE FOR EFFECT PHASE
"ADD 50, FIRE FOR EFFECT, OVER."
"ADD 50, FIRE FOR EFFECT, OUT."
"SHOT, OVER."
"SHOT, OUT."
"ROUNDS COMPLETE,* OVER."
"ROUNDS COMPLETE, OUT."
"END OF MISSION, 20 CASUALTIES, REST OF PLATOON DISPERSED, OVER."
"END OF MISSION, 20 CASUALTIES, REST OF PLATOON DISPERSED, OUT."
*ROUNDS COMPLETE MEANS ALL ROUNDS TO BE EXPENDED IN FIRE FOR EFFECT HAVE BEEN FIRED.

Example 4.

3. Observe the results of fire for effect and report the results. When the smoke clears, tell the FDC what the results are. Such things as the number of casualties, damaged equipment, stalled tracks, etc., are important. (See example 4.)

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4. In the event that fire is required within 600 meters of friendly troops, the following guidelines apply.

a. Announce "danger close" to the FDC in the initial call for fire.

b. Initial target location is reported on the enemy side of the target.

c. Creeping procedures are used to adjust danger-close fire.

(1) Range corrections should not exceed 100 meters.

(2) Never bracket; it could cause friendly casualties.

NOTE: In a hostile environment, authentication may be required before fire is delivered.

REFERENCES:

TC 6-40-4, Fire for Effect, Mar 77 (part 1, page 2-8, 10-17; part 2, page 20-26; part 3, page 28-34; part 4, page 36-40)
TEC Lesson 949-061-0001F, Determination of Direction
TEC Lesson 949-061-0002F, Target Location: Polar Plot and Grid Coordinate Method
TEC Lesson 949-061-0003F, Locate a Target by Shift from a Known Point
TEC Lesson 949-061-0004F, The Call for Fire
TEC Lesson 949-061-0005F, Adjustment of Indirect Fire by the Bracketing and Creeping Methods, Part I
TEC Lesson 949-061-0006F, Adjustment of Indirect Fire by the Bracketing and Creeping Methods, Part II

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TASK NUMBER: 061-283-6004

LOCATE A TARGET BY POLAR PLOT

CONDITIONS:

You will be given binoculars, a compass, a protractor, a coordinate scale, a pencil, and a 1:50,000 scale military map of the target area. You have identified a target. Your position is plotted on your map and known by the fire direction center (FDC).

STANDARDS:

Locate the target within 250 meters of the actual location. Announce target location within 90 seconds after identification. Express direction to the nearest 10 mils and within 100 mils of the actual direction. Express distance to the nearest 100 meters.

PERFORMANCE MEASURES:

1. Determine direction to the target. Direction may be determined using a compass, computed by adding or subtracting differences from a known direction (see task 061-283-6002), determined using a map and protractor (see task 071-329-1010), or estimated.

2. Estimate distance to the target. Distance can be estimated by the football-field method. A football field is 100 yards long, and 100 yards is approximately 100 meters. Therefore, a target that is about 7 football fields away from the OP is at a distance of 700 meters. Another method of estimating distance is the flash-to-bang method. After observing a flash or burst in the target area, the observer counts the number of seconds until he hears the sound. He then multiplies the number of seconds times 350 (350 meters per second is the approximate speed of sound) to obtain the approximate distance, e.g., 3 seconds X 350 = 1050 meters, expressed as a distance of 1000 meters.

REFERENCES:

TC 6-40-4, Fire for Effect, Mar 77 (part 1, page 6, 7, 10, 17)
TEC Lesson 949-061-0002-F, Target Location

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TASK NUMBER: 071-329-1021

DETERMINE AN ENEMY TARGET LOCATION USING GRID COORDINATES

CONDITIONS:

Acting as a forward observer at a known location, given binoculars (if available), a standard 1:50,000 scale military map, compass, coordinate scale and protractor, pencil, paper, and a target requiring indirect fire.

STANDARDS:

Determine the six-digit grid coordinates of the target (grid coordinates must be within 250 meters of actual target location) within 90 seconds after identification.

PERFORMANCE MEASURES:

1. **To orient a map using a compass:**

a. With the map in a horizontal position, place the compass with the straightedge along one of the north-south grid lines and the cover of the compass pointing toward the top of the map.

b. Rotate the map and compass until the north-seeking arrow is alined with the compass index line.

c. This procedure will orient the map close enough to the terrain features to allow location of the target.

NOTE: Do not move the map, once you have it oriented, until you have performed step 3.

2. **To orient the map by terrain association:**

a. Knowing one of the four cardinal directions or a very identifiable natural or manmade terrain feature will increase the speed and accuracy in orienting the map.

b. Rotate the map until the terrain features to the front (hills, valleys, roads, or streams) are alined with the same terrain features on the map.

NOTE: Do not move the map, once you have it oriented, until you have performed step 3.

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3. **To locate the target:** Identify it with one of the terrain features on the ground. Locate this terrain feature on the map and plot the target on the map in the same relation to it as it is on the ground.

4. **To determine the six-digit grid coordinates of the point plotted on the map:** See task: **Determine the grid coordinates of a point on a military map using the military grid reference system.**

NOTE: To call fire on the target you have just located: See task: Call for/adjust indirect fire.

REFERENCES:

None

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION V
COMPUTING

TASK SUMMARIES

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INTRODUCTION TO M16 PLOTTING BOARD

1. DESCRIPTION OF THE M16 PLOTTING BOARD.

The M16 plotting board consists of a rotating disk of transparent plastic and a removable range arm, both attached to a flat grid base (figure 1).

a. Base. The base is a white plastic sheet bonded to a magnesium alloy backing. A grid is printed on the base in red or green, at a scale of 1:12,500.

(1) The vertical centerline is graduated and numbered upward and downward from the center (pivot point) from 0 through 31 in hundreds of meters. The numbers are spaced every second (thin) horizontal line. Each small grid square represents 50 meters. To the left of the vertical centerline is an alternate range scale from 0 to 6000 meters inclusive. This scale facilitates range determination when the mortars are plotted below the pivot point.

(2) The index mark points to the center of the vernier scale at the top edge of the plotting board. The index mark is the point at which deflections or azimuths may be read to the nearest 10 mils. The operating position of the board is with the straight side of the base to the operator's right. When plotting at the pivot point, it represents the location of No. 2 mortar.

(3) In addition to the grid pattern, a vernier scale is printed on the base. It is used to get greater accuracy when reading the mil scale on the azimuth disk. The vernier scale permits the operator to read azimuths and deflections accurately to the nearest 1 mil when the index mark is between one of the 10-mil graduations on the scale of the azimuth disk.

(4) On the straight edge of the base, a double map scale in meters with representative fractions of 1:50,000 and 1:25,000 is available for use in transferring data to and from a map that has one of these scales.

b. Azimuth Disk. The rotating azimuth disk is made of plastic. It is roughened on the upper surface for marking and writing. A mil scale on the outer edge runs clockwise to conform to the azimuth scale of a compass, and it is used for plotting azimuths and angles. The scale is divided into 10-mil increments from 0 to 6400 and is numbered every 100 mils. In addition, the disk has two black lines referred to as centerlines. They are printed across the center of the disk from 0 to 3200 and from 1600 to 4800 mils. They serve no purpose in mortar gunnery other than to assist in orienting the disk.

c. Range Arm. The range arm is used when the mortars are located at the pivot point. It is made of plastic and can be plugged into the pivot point.

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On the arm is a range scale, a centerline, and a vernier scale. The arm eliminates the need for rotating the disk away from the observer-target (OT) azimuth to read deflections or ranges.

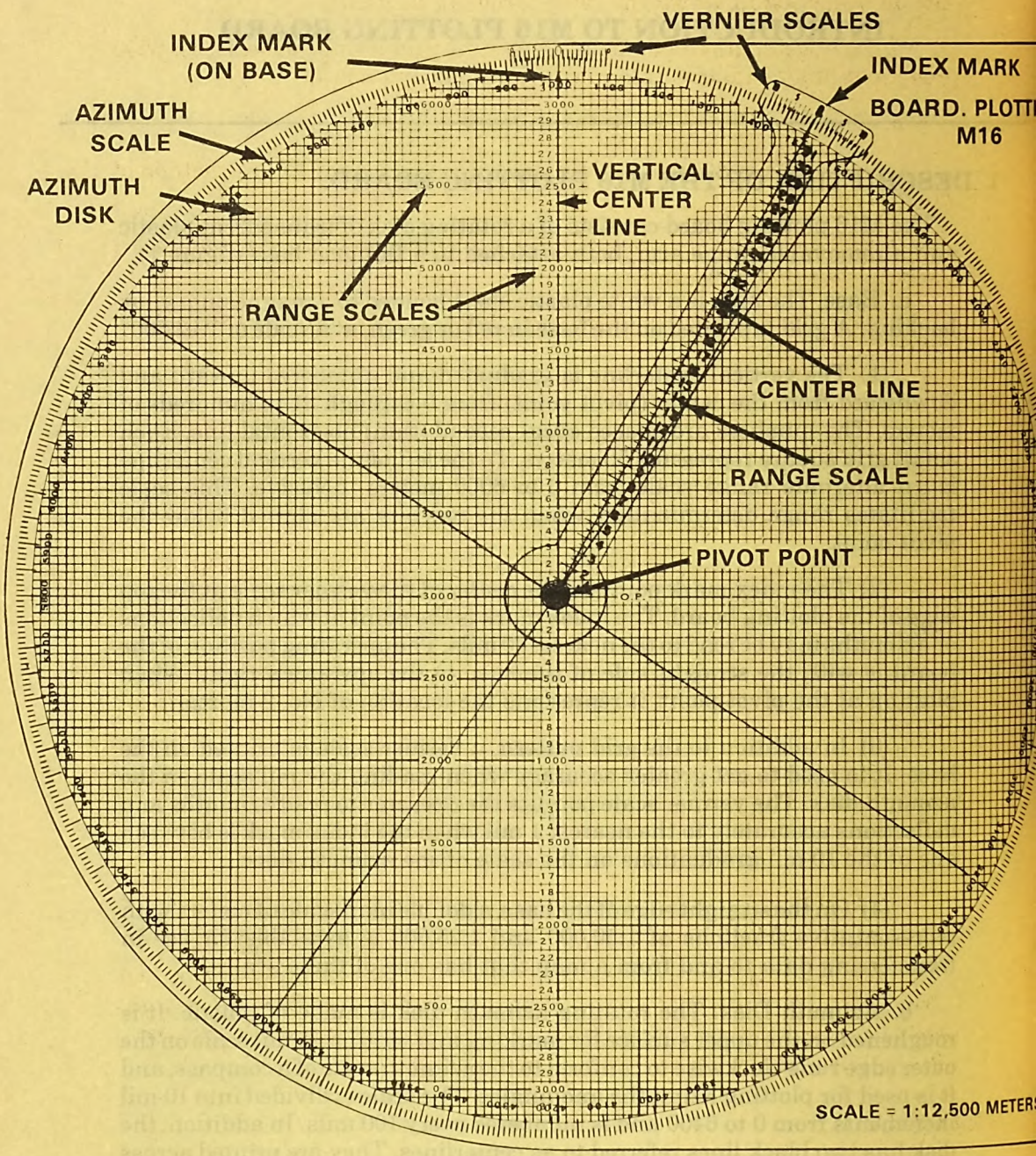

Figure 1.

2. **METHODS OF USING THE M16 PLOTTING BOARD.** There are four methods of using the M16 plotting board.

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a. Observed Chart, Pivot Point.

(1) In this method, the pivot point represents the No. 2 mortar. This is the only method in which the range arm can be used.

(2) In using this method, the maximum range that can be fired is 3200 meters without changing the scale of the plotting board.

b. Observed Chart, Below Pivot Point.

(1) In this method, the computer will use the parallel line method of computing.

(2) The mortar position is plotted 1000 meters to the right and 2000 meters below the pivot point.

(3) This allows the computer to plot fires to the maximum range of the mortar (4595 meters).

c. Modified-Observed Chart.

(1) In setting up a modified-observed chart, one point must be known to survey accuracy (valid 8-digit coordinate). This can be either the mortar position, a registration point or any target in the area of responsibility. Normally, this point will be the mortar position.

(2) Plot the mortar position on the map; and, by map inspection, the grid intersection must be selected to represent the pivot point on the plotting board.

(3) After determining the grid intersection, a coordinate system is superimposed on the disk (disk must be oriented to index 0 at the index mark).

(4) Points can now be plotted on the plotting board by coordinates since the board is now a map of the area of responsibility.

d. Surveyed Chart.

(1) This is the most accurate method of using the plotting board, although the modified-observed chart is the most often used method.

(2) The only difference between the surveyed chart and the modified-observed chart is that, with a surveyed chart, two points must be known to survey accuracy (valid 8-digit coordinate): the mortar position and a point in the impact area (normally the registration point).

REFERENCE:

None.

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TASK NUMBER: 071-321-1601

PREPARE M16 PLOTTING BOARD FOR OPERATION AS AN OBSERVED CHART AND DETERMINE INITIAL FIRING DATA FOR MORTARS (PIVOT POINT)

CONDITIONS:

Given an M16 plotting board, a computer's record form, range and direction to the reference point (RP), firing table (FT) 81-AI-3 or the card firing table packed with the ammunition, a referred deflection of 2800 mils., and a no. 2 pencil.

STANDARDS

Within 5 minutes, prepare the M16 plotting board and computer's record IAW the performance measures below:

PERFORMANCE MEASURES:

1. **Preparation of the M16 Plotting Board for Operation** (figure 1).

a. The direction of fire given to you must be rounded off to the nearest 50 mils to determine your mounting azimuth.

NOTE: The direction of fire used in this task is 2316 mils.

b. In rounding off the direction of fire (2316), the mounting azimuth is 2300.

c. With the mounting azimuth known, set up the plotting board. To do this:

(1) Rotate the azimuth disc and index the mounting azimuth at the index mark (aline the tic mark for azimuth 2300 directly over the index mark).

(2) Using a no. 2 pencil, write in the referred deflection being used (in this case, 28) below azimuth 2300 on the azimuth disc (figure 1).

(3) After placing the referred deflection (28) on the disc, place enough deflection scale on the disc to cover the area of responsibility. Using the LARS rule (Left Add-Right Subtract), place the rest of the deflection scale on the disc. Going left every 100 mils, the deflection increases as the azimuth scale decreases; going right, the deflection scale decreases as the azimuth scale increases. From 400 to 500 mils left and right of the referred deflection will normally cover the area of responsibility (figure 1).

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NOTE: When using the M34A2 sights on the mortars, the deflection given will never be above 3199. The next number to place on the azimuth disc after 31 is 0. (The reason for this is that the deflection scale on the M34A2 sight is divided into two half circles, 0-3199 and 0-3199).

(4) To plot the first round (range must be known—in this example, the range is 2600 meters), index the direction of fire (azimuth from mortar to target, 2316 mils). Then from the pivot point move up the range scale to the range of 2600 meters. Make a very small plot directly over the vertical center line, circle it, and label it with a small number 1 (figure 1).

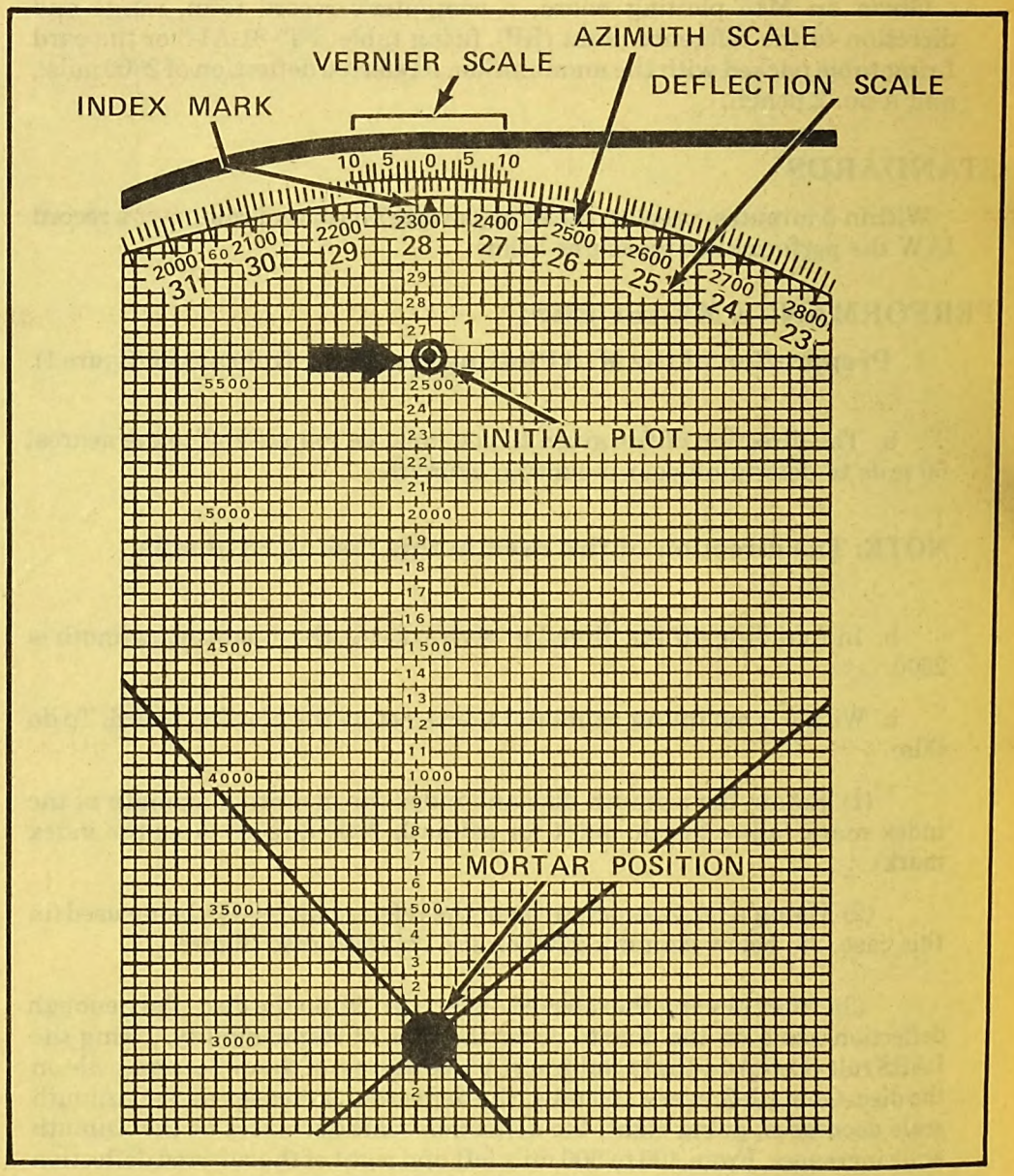

Figure 1.

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(5) To determine the deflection for the first round, keep the direction of fire (2316) indexed and read the deflection as follows (figure 2):

(a) First two digits are read from the deflection scale the computer placed on the plotting board. Since deflections increase to the left, look for the first number to the right of the index mark. In this example, it is 27 (figure 2).

(b) The third digit is read from the 10-mil marks between deflection numbers 27 and 28. The index mark is between the eight and ninth 10-mil mark which makes the third digit 8.

(c) The fourth digit is read at the vernier scale. For deflections, use the left half of the scale. Count the 1-mil marks starting at the 0, to the left until one of the 1-mil marks of the vernier scale and one of the 10-mil marks on the azimuth disc are alined. In this case, the fourth 1-mil mark is alined, making the fourth digit 4 (figure 2).

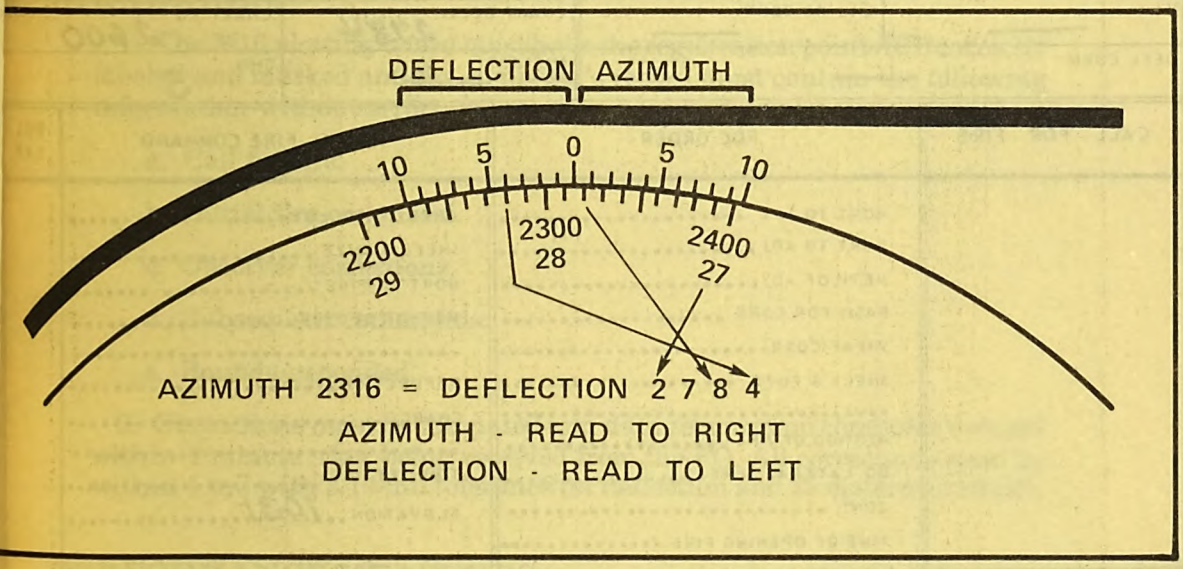

Figure 2.

2. **Preparation of Computer's Record Heading** (figure 3).

a. Organization - Write in the unit that is firing the mission.

b. Date - write in the date the mission is fired.

c. Time - Write in the time the call for fire is received.

d. Target Number - If the target is given a target number it will be written here. (Only targets that the FDC considers of possible future value will be given a number.)

e. CHART DEFL (Deflection) - Write in the deflection that the first round will be fired on.

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f. CHART RG (Range) - Write in the range that the first round will be fired at.

g. CHG (Charge) - Write in the charge that will be left on the round when fired.

(1) All rounds will be fired at lowest possible charge.

(2) At the time the charge is selected and recorded, also determine and record the elevation in the INITIAL FIRE COMMAND block (figure 3).

NOTE: The spaces left blank in the heading are for advanced procedures and will be discussed in other tasks.

COMPUTER'S RECORD

For use of this form, see FM 23 - 91, the proponent agency is U. S. Continental Army Command

ORG	DATE	TIME	TGT NO.
A Co 1/66	19 Mar	0935	RP1

VI	CHG RG CORR	CHART DEFL	CHART RG
—	—	2784	2600

DEFL CORR	ANGLE T	CHG
—	—	5

CALL - FOR - FIRE	FDC ORDER	INITIAL FIRE COMMAND	RDS EXP
	MORT TO FFE MORT TO ADJ METH OF ADJ BASIS FOR CORR SHEAF CORR SHELL & FUZE METHOD OF FFE RG LATERAL SPREAD ZONE TIME OF OPENING FIRE	MORT TO FOLLOW SHELL & FUZE MORT TO FIRE METHOD OF FIRE DEFLECTION CHARGE TIME SETTING ELEVATION 1031	

Figure 3.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (page 15-3, para 15-5)
TEC Lesson 010-071-6602-F, 3-F, 4-F, and 5-F, FDC, Observed Chart Method, Parts 1-4

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TASK NUMBER: 071-321-1602

PROCESS SUBSEQUENT FO CORRECTIONS USING M16 PLOTTING BOARD (PIVOT POINT)

CONDITIONS:

Given an M16 plotting board prepared for operation for a registration mission, to include deflection scale and a first-round plot that is labeled and marked; firing tables; computer's record with heading and FDC order completed; no. 2 pencil; TA-312/PT; FO's call for fire; and three subsequent corrections.

STANDARDS:

1. The M16 plotting board must have the registration point (RP) correctly labeled and marked and the computer's record must contain the following information without error:

   a. Call for fire.

   b. Initial fire command.

   c. Observer corrections.

   d. Subsequent commands.

   e. Rounds expended.

2. Corrections must be computed and data recorded on computer's record within 1 minute after being received from the FO. All corrections must be within 1 mil with a 10-mil tolerance for deflection and 25 meters for range.

PERFORMANCE MEASURES:

1. Record the call-for-fire on the computer's record just as it is received from the FO. This must include the FO's call-sign.

   a. The call for fire will be checked to determine if it contains enough information to fire the mission.

   b. The FDC order will then be filled out, which will tell the computer how to fire the mission.

2. With the information contained in the **heading**, the CALL-FOR-FIRE block, and the FDC ORDER, the computer can fill out the INITIAL FIRE COMMAND (figure 1).

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REFERRED DEFLECTION 2800

DIRECTION OF FIRE 2316
MOUNTING AZIMUTH 2300

COMPUTER'S RECORD

For use of this form, see FM 23-91, the proponent agency is U. S. Continental Army Command

ORG	DATE	TIME	TGT NO.
A Co 1/66	19 Mar	0935	RP1

VI	CHG RG CORR	CHART DEFL	CHART RG
—	—	2784	2600

DEFL CORR	ANGLE T	CHG
—	—	5

CALL-FOR-FIRE	FDC ORDER	INITIAL FIRE COMMAND	RDS EXP
FIA25 Adjust Fire Dir 1830 Reg	MORT TO FFE ... Sec MORT TO ADJ ... #2 METH OF ADJ ... 1 Rd BASIS FOR CORR ... — SHEAF CORR ... SHELL & FUZE ... H.E.Q METHOD OF FFE ... RG LATERAL SPREAD ... ZONE ... TIME OF OPENING FIRE ... W.I.R	MORT TO FOLLOW ... Section SHELL & FUZE ... H.E.Q MORT TO FIRE ... #2 METHOD OF FIRE ... 1 Rd DEFLECTION ... 2784 CHARGE ... 5 TIME SETTING ... ELEVATION ... 1031	①

OBSERVER CORR			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RG	(TIME) HEIGHT	DEFL	CHG (RG)	MORT FIRE	METHOD FIRE	DEFL	RG / CHG	TIME SETTING	ELEV	
R50	+100						2788	2700		988	②
	-50						276	2650		1010	③
	+25	EOM Reg Comp					2781	2675		999	

AMMUNITION

LOT NUMBER										
TYPE										
ON HAND										
RECEIVED										
TOTAL										
EXPENDED										
REMAINING										

DA FORM 1 OCT 71 2399-R

REPLACES DA FORM 2399, 1 JUL 68, WHICH IS OBSOLETE.

Figure 1.

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a. MORT TO FOLLOW - Write in the mortar(s) that will follow all commands from the FDC. In this example, all mortars will follow the commands, so the computer will write in "SECTION."

b. SHELL & FUZE - Based on the FDC order, write in "HEQ" (high explosive, super quick fuze).

c. MORT TO FIRE - Based on the FDC order, the mortar to adjust is "#2."

d. METHOD OF FIRE - Again based on the FDC order, the adjustment will be "1 rd" (meaning one round at a time).

e. DEFLECTION - is taken from the heading of the computer's record, under CHART DEFL, "2784."

f. CHARGE - Again, take it from the heading, "5".

g. TIME SETTING - Since this space applies only to illumination ammo, leave it blank.

h. ELEVATION - This should be recorded at the time the charge is selected.

3. After completing the initial fire command, as the computer, place a "1" in the (RDS EXP) (rounds expended) column. When the round is fired, a circle is placed around the number to indicate the round has been fired.

4. Receive and record the FO's correction (figure 1).

a. To compute new data from the FO's correction, accomplish the following:

(1) Index the FO's direction (taken from the call for fire) at the index mark on the plotting board. (Place a triangle (△) below FO's direction.)

(2) Plot the FO's correction from the last round fired - in this example, round #1. Go to the right 50 meters, or the equivalent of one small square, and up 100 meters, or the equivalent of two small squares. There, make a small plot, circle it, and label it "#2."

(3) To determine the new deflection, range, charge, and elevation:

(a) Rotate the disk until the #2 plot is directly over the vertical line.

(b) Read the deflection for #2 plot and record (figure 1).

(c) Determine the range for #2 plot and record (figure 1).

(d) Using the firing table, determine the charge and elevation of #2 plot (figure 1).

b. Repeat the above steps for all corrections sent by the FO until the mission is completed.

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5. As the computer, you must keep track of the number of rounds fired. Do this by recording the rounds fired in the RDS EXP column and circle them as they are fired.

6. AT the time the FO sends "ADD (DROPS) 25, END OF MISSION (EOM), REGISTRATION COMPLETE," the computer will plot this correction and determine the data, but the round will not be fired. The computer will erase all but the last plot from the board. The last plot marks the RP and is given an RP symbol (figure 2).

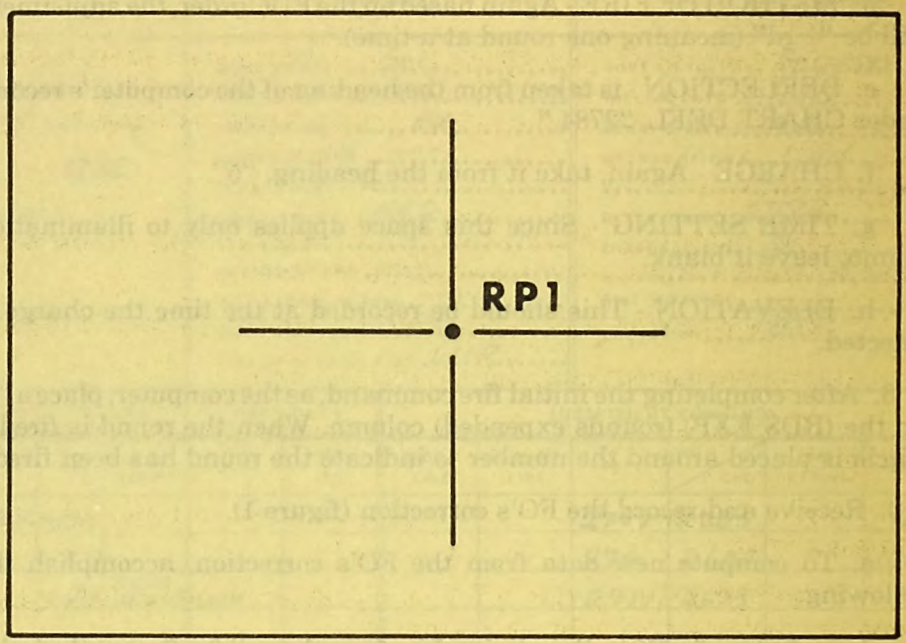

Figure 2.

NOTE: If the FO wants the last round fired to see if it will hit the RP, his last correction would simply be "ADD (DROP) 25." The round would be fired, and the FO would come back with, "END OF MISSION, REGISTRATION COMPLETE."

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 15, page 15-3, para 15-5)
TEC Lesson 010-071-6602-F, 3-F, 4-F, and 5-F: FDC, Observed Chart Method, Parts 1-4

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TASK NUMBER: 071-321-1603

PREPARE M16 PLOTTING BOARD FOR OPERATION AS OBSERVED CHART (BELOW PIVOT POINT) AND MODIFIED OBSERVED CHART

CONDITIONS:

As the fire direction computer for an 81-mm mortar, given an M16 plotting board, 1:50,000 map, tabular firing tables, overlay of company's area of responsibility to include mortar position, and referred deflection.

STANDARDS:

1. Prepare the M16 plotting board as an observed chart (below pivot point) within 5 minutes and accomplish the following:

a. Determine direction of fire within 1 mil with a tolerance of 10 mils.

b. Determine mounting azimuth without error.

c. Superimpose referred deflection that corresponds to the mounting azimuth.

d. Plot all known locations of mortars, targets, and reference points without error.

2. Prepare the M16 plotting board as a modified observed chart within 5 minutes and accomplish the following:

a. Determine grid intersection.

b. Establish a coordinate system which represents all of the company's area of responsibility.

c. Plot location of mortars accurately to within 10 meters (8-digit coordinates); targets and reference point accurately to within 100 meters (6-digit coordinates).

d. Determine direction of fire within 1 mil with a tolerance of 10 mils.

e. Determine the mounting azimuth without error.

f. Superimpose the referred deflection that corresponds to the mounting azimuth.

PERFORMANCE MEASURES:

1. **OBSERVED CHART** (below pivot point) (figure 1).

SPECIFIC REFERENCE: FM 23-91, page 15-11, paragraph 15-20.

a. Determine data to set up plotting board.

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(1) Using the overlay, plot the mortar position and the reference point (RP) on the map.

(2) Using a mil protractor, determine the grid azimuth from the mortar position to the RP. Record this azimuth (direction of fire) in the top margin of the computer's record.

(3) To determine the mounting azimuth, round the direction of fire to the nearest 50 mils.

EXAMPLE:	Direction of Fire	Mounting Azimuth
	2315	2300
	2425	2450
	2435	2450

(4) Record the mounting azimuth in the top margin of the computer's record.

(5) To set up the deflection scale on the plotting board, rotate the disk until the mounting azimuth is at the index mark. Directly below the mounting azimuth, write in the referred deflection (normally 2800) using the first two digits (28). Continue right or left of 28, using the LARS (Left Add-Right Subtract) rule, 400 to 500 mils (figure 1).

(6) To determine the chart deflection to fire the first round, index the grid azimuth (direction of fire) and read the deflection that corresponds to the grid azimuth. Record in chart deflection block of computer's record.

(7) The next step is to determine the range from the mortar position to the reference point. Using the edge of the computer's record, place it along the line from the mortar to the RP, place a tick mark at the mortar and one at the RP. Using the range scale on the map, determine the range in meters. Record this in the chart range block of the computer's record.

(8) To complete setting up the plotting board, the mortar and RP must be plotted. Keeping the chart deflection indexed, move 1000 meters to the right of the pivot point and down 2000 meters (figure 1). There, make a small plot and inclose it with the mortar symbol (figure 1). To plot the RP (range 2150 meters), count the large and small squares, go straight up the board to the range, make a small plot, circle it, and number it (figure 1).

b. Corrections sent by the FO will be plotted and read using the PARALLEL LINE METHOD OF PLOTTING.

2. **MODIFIED OBSERVED CHART** (figure 3).

SPECIFIC REFERENCE: FM23-91, page 15-9, paragraph 15-11 to 15-13.

a. Using the overlay, plot the mortar position and the reference point (RP) on the map.

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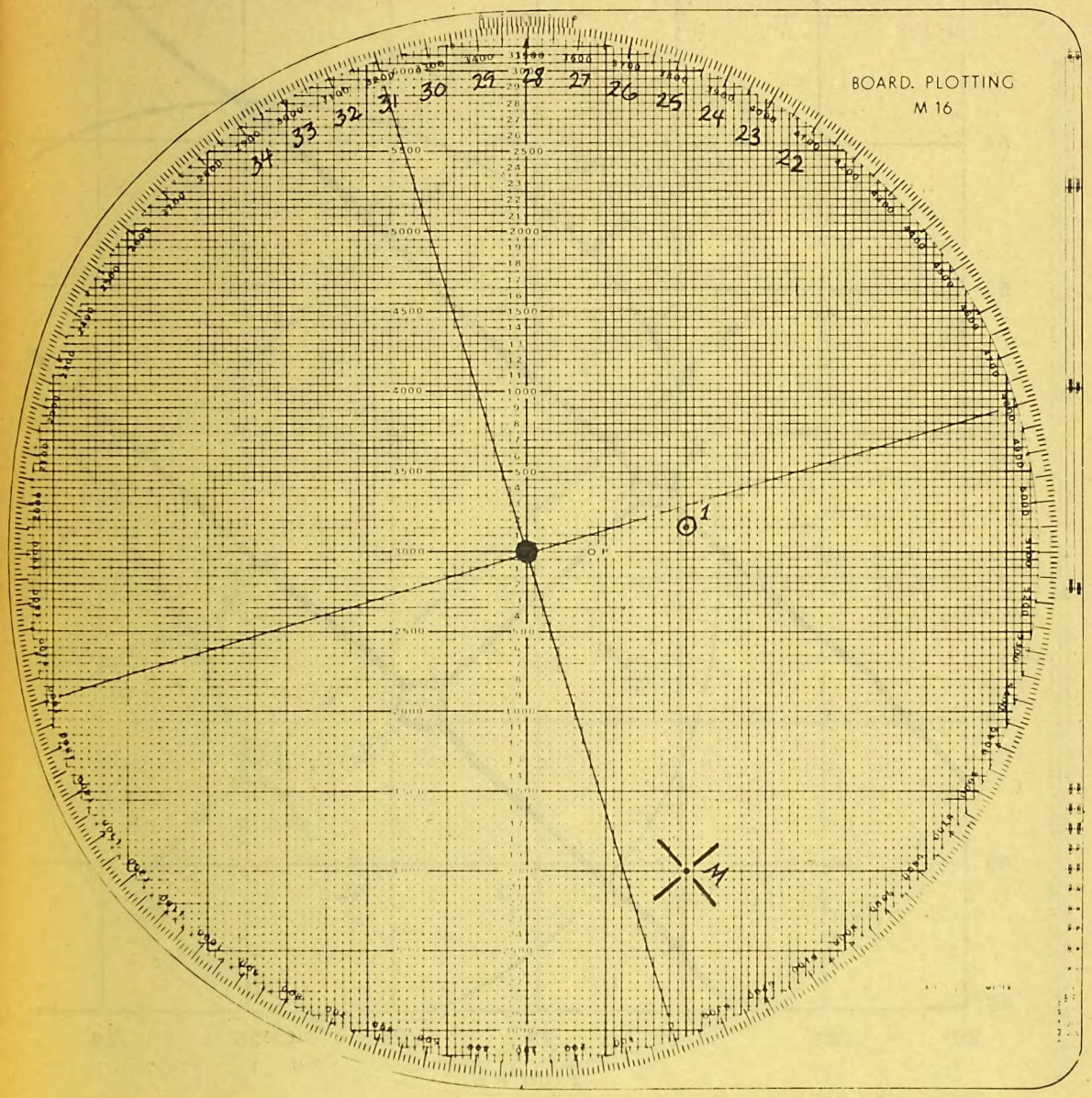

Figure 1.

b. Determine the grid coordinates of the mortar position to within 10 meters (8-digit coordinates). Record the coordinates in the top margin of the computer's record.

c. Determine the grid coordinates of the RP to within 100 meters (6-digit coordinates). Record these coordinates in the top margin of the computer's record.

d. Select on the map a grid intersection which, when transferred to the pivot point of the plotting board, permits establishment of a coordinate system that allows as much as possible of the company sector of

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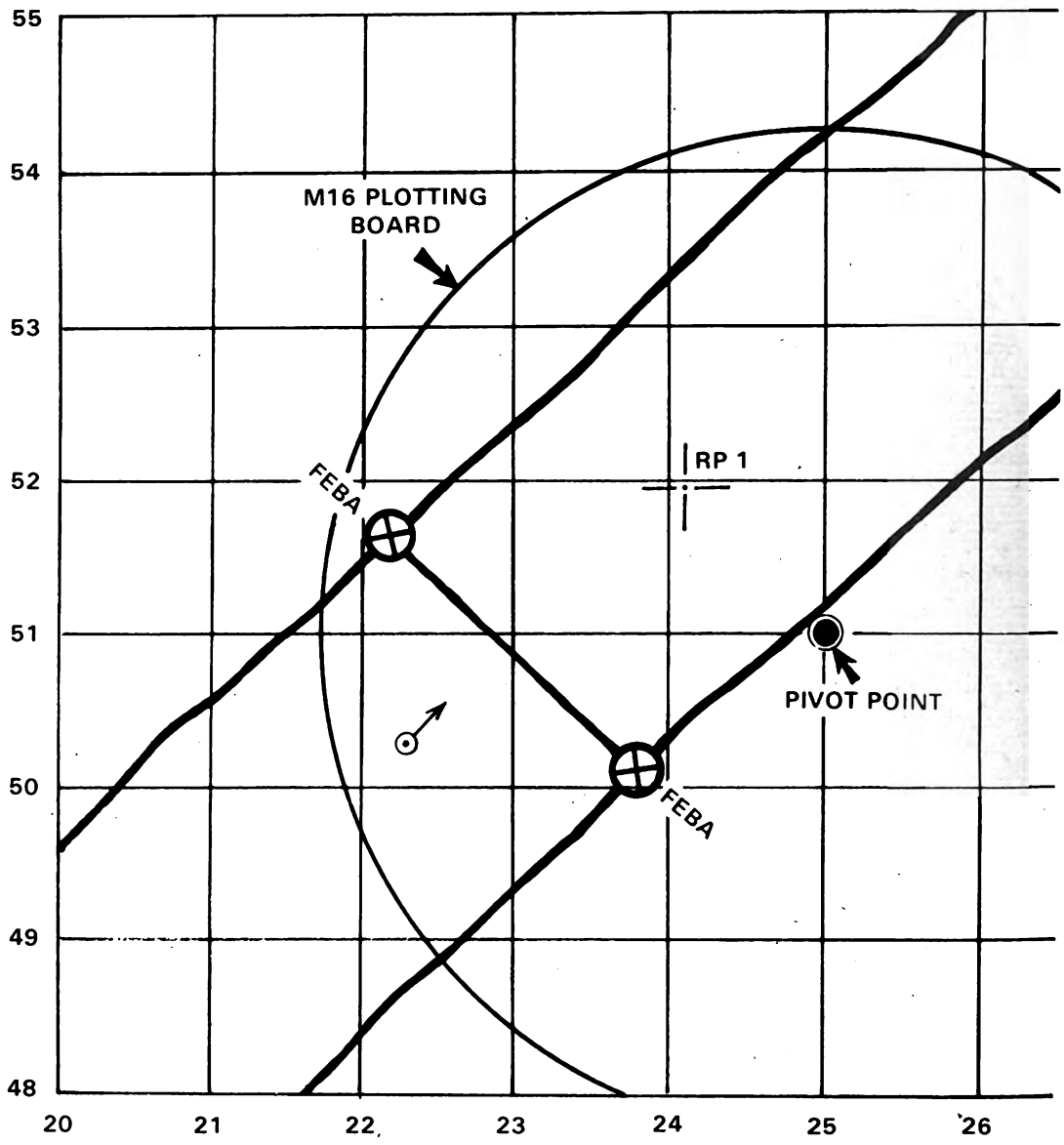

Figure 2.

responsibility to be represented on the plotting board. To do this, use the following three rules:

(1) Grid intersection must be outside the company's area of responsibility.

(2) It must be as close as possible to the company's area of responsibility.

(3) It must be 1500 to 2000 meters in front of the mortar position. In figure 2 the grid intersection is 2551.

e. After determining the grid intersection, the coordinate system will be set up on the plotting board as follows:

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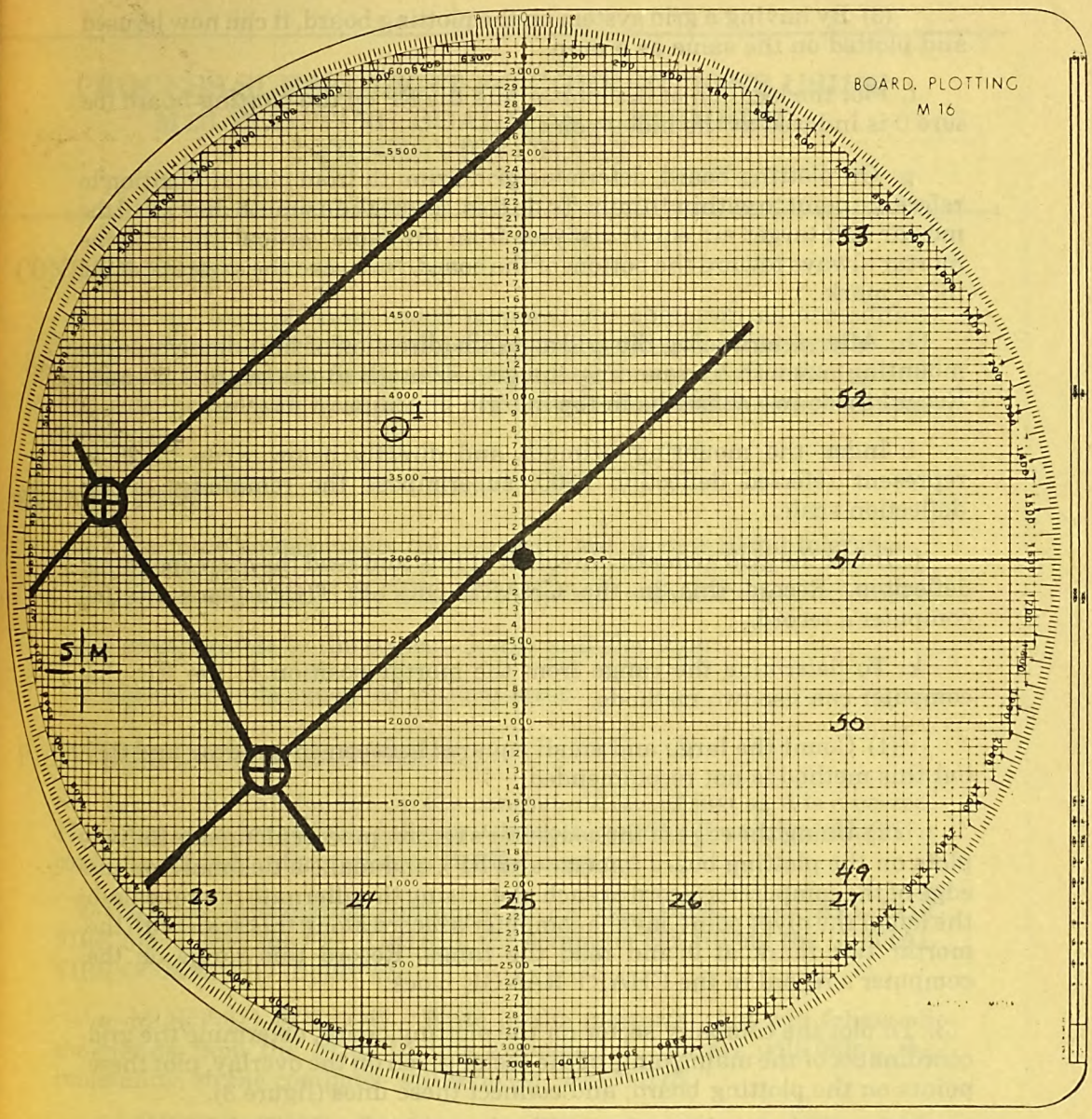

Figure 3.

(1) The first two digits (25) will be placed 2000 meters below the pivot point (be sure 0 is indexed at index point) (figure 3). Then go 2000 meters to the left or right of pivot point and write in the second two digits (51) (figure 3).

(2) The grid numbers for the NORTH-SOUTH grid line increase from the left to right and the EAST-WEST grid line increase from bottom to top. Using the two grid numbers now on the disk, complete the grid system placing the grid number every 1000 (two large squares) meters (figure 3).

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(3) By having a grid system on the plotting board, it can now be used and plotted on the same as a map.

f. Plot the location of the mortar and the RP on the plotting board (be sure 0 is indexed at the index point).

g. On plotting board, determine grid azimuth from mortar position to reference point to within 10 mils. To do this, rotate the azimuth disk until the mortar and target are equal distance from the same vertical line with the mortar always toward the bottom of the board. Now read the azimuth at the index mark.

h. After determining the grid azimuth (direction of fire), determine the mounting azimuth by rounding the grid azimuth to the nearest 50 mils. Record these two azimuths in top margin of computer's record.

i. Index the mounting azimuth and directly below write in 28 to represent referred deflection 2800; superimpose the remainder of the deflection scale.

j. Index the grid azimuth (direction of fire) and read the corresponding defleciton. Record this in the CHART DEFLECTION block of the computer's record.

k. To determine the range from the mortar position to the RP, the computer can use two methods.

(1) Count the large and small squares between the mortar and RP, but this method is not recommended.

(2) Using the edge of the computer's record, place it alongside the two plots on the plotting board (mortar and RP), and make a tick mark on the edge of the computer's record at each plot. Using the alternate range scale to the left of the pivot point, lay the computer's record along this scale with the mortar tick mark at 0 and read the range. Record this range on the computer's record in the CHART RANGE block.

3. To plot the company sector on the plotting board, determine the grid coordinates of the main points of the sector given on the overlay, plot these points on the plotting board, and connect these lines (figure 3).

NOTE: By having one point known to an 8-digit coordinate and one to a 6-digit coordinate, a MODIFIED OBSERVED CHART will be set up. When both points are known to an 8-digit coordinate, a SURVEY CHART will be set up.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 15, page 15-9, para 15-12, 15-13; page 15-17, para 15-20)
TEC Lesson 010-071-6601-F, Prepare M16 Plotting Board for Operation

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TASK NUMBER: 071-321-1604

PROCESS SUBSEQUENT FO CORRECTIONS USING M16 PLOTTING BOARD AS A MODIFIED OBSERVED CHART

CONDITIONS:

Given an M16 plotting board prepared for operation as a modified observed chart, to include coordinate system; deflection scale; mortar and reference point plotted; firing tables; computer's record with heading and FDC order completed; no. 2 pencil; FO's call for fire; and three subsequent corrections.

STANDARDS:

1. Determine deflections to the nearest 1 mil, with a 10-mil tolerance.
2. Determine range to the nearest 25 meters, with a 25-meter tolerance.
3. Convert range to the correct charge and elevation.
4. Record rounds expended without error.

PERFORMANCE MEASURES:

1. Record the call for fire on the computer's record just as it is received. This must include the FO's callsign. Check the call for fire to determine if it contains enough information to fire the mission.

2. With the information contained in the HEADING, the CALL FOR FIRE block, and the FDC ORDER, the computer can fill out the INITIAL FIRE COMMAND (figure 1).

a. MORT TO FOLLOW - Write in the mortar(s) that will follow all commands from the FDC. In this example, all mortars will follow the commands, so the computer will write in "SECTION."

b. SHELL& FUZE - Based on the FDC order, write in HEQ (high explosive, super quick fuze).

c. MORT TO FIRE - Based on the FDC order, the mortar to adjust is "#2."

d. METHOD OF FIRE - Again based on the FDC order, the adjustment will be "1 rd" (meaning one round at a time).

e. DEFLECTION - Take it from the heading of the computer's record, under CHART DEFL, "2813".

f. CHARGE - Again, take it from the heading "5".

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MORTAR Grid 22295031
RP Grid 241517
Grid Intersection 2551

Direction of Fire 0937
MOUNTING AZ 0950
Refered Deflection 2800

COMPUTER'S RECORD

For use of this form, see FM 23-91, the proponent agency is U. S. Continental Army Command

ORG	DATE	TIME	TGT NO.
A Co 1/66	20 Mar	1700	RP1

V	CHG RG CORR	CHART DEFL	CHART RG
—	—	2813	2275

DEFL CORR	ANGLE T	CHG
—	—	4

CALL FOR FIRE	FDC ORDER	INITIAL FIRE COMMAND	RDS EXP
FIA25 ADJUST FIRE DIR 0810 REG	MORT TO FFE ... SEC MORT TO ADJ ... #2 METH OF ADJ ... 1 Rd BASIS FOR CORR ... SHEAF CORR ... SHELL & FUZE ... HEQ METHOD OF FFE ... RG LATERAL SPREAD ... ZONE ... TIME OF OPENING FIRE ... WIR	MORT TO FOLLOW ... SEC SHELL & FUZE ... HEQ MORT TO FIRE ... #2 METHOD OF FIRE ... 1 Rd ... DEFLECTION ... 2813 CHARGE ... 4 ... TIME SETTING ... ELEVATION ... 988	①

OBSERVER CORR			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RG	TIME HEIGHT	DEFL	CHG (RG)	MORT FIRE	METHOD FIRE	DEFL	RG / CHG	TIME SETTING	ELEV	
L30	100						2826	2175		1039	②
	+50						2829	2225		1015	③
	-25		EOM REG COMP				2828	2200		1027	

AMMUNITION

LOT NUMBER									
TYPE									
ON HAND									
RECEIVED									
TOTAL									
EXPENDED									
REMAINING									

DA FORM 2399-R

Figure 1.

2-V-A-4.2

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g. TIME SETTING - Since this space applies only to illumination ammo, leave it blank.

h. ELEVATION - This should be recorded at the time the charge is selected.

3. After completing the initial fire command, as the computer, place a "1" in the RDS EXP (rounds expended) column. When the round is fired, circle the number to indicate the round has been fired.

4. Receive and record the FO's correction (fig 1).

a. To compute new data from the FO's correction, accomplish the following:

(1) Index the FO's direction (taken from the call for fire) at the index mark on the plotting board. (To make the FO's direction easier to identify, draw in a small triangle below FO's direction.)

(2) Plot the FO's correction from the last round fired - in this example, round #1. Go to the left 30 meters, or the equivalent of 3/5 of one small square, and down 100 meters, or the equivalent of two small squares. There, make a small plot, circle it, and label it "2".

(3) To determine the new deflection, range, charge, and elevation:

(a) Rotate the disk until the #2 plot is alined with the mortar plot. (The mortar and #2 plot must be equal distance from the same vertical line and on the same side of the same vertical line.)

(b) Keeping the plots alined, read the deflection for plot #2 and record on the computer's record (fig 1).

(c) Determine the range using the edge of the computer's record with tic marks for the mortar and #2 plot using the alternate range scale. Using firing table, select and record elevation (fig 1).

(d) Place a "2" in the RDS EXP column.

(4) Repeat the above steps for all corrections sent by the FO until the mission is completed.

5. As the computer, you must keep track of the number of rounds fired. Do this by recording the rounds fired in the RDS EXP column and circle them as they are fired.

6. At the time the FO sends "ADD (DROP) 25, END OF MISSION (EOM), REGISTRATION COMPLETE", the computer will plot this correction and determine the data, but the round will not be fired. The computer will erase all but the last plot from the board. The last plot marks the RP and is given an RP symbol (fig 2).

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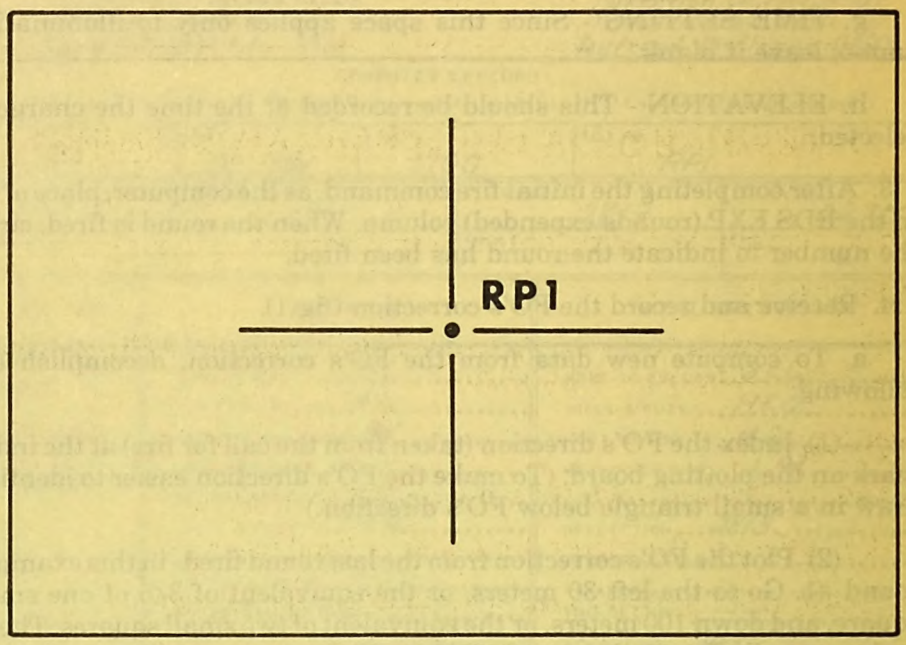

Figure 2.

NOTE: If the FO wants the last round fired to see if it will hit the RP, his last correction would simply be "ADD (DROP) 25". The round would be fired, and the FO would come back with, "END OF MISSION, REGISTRATION COMPLETE."

REFERENCES:

FM 23-91, Mortar Gunner, Dec 71 (chap 15, page 15-9, para 15-11 thru 15-13)

TEC Lesson 010-071-6606-F, 7-F. FDC: Modified Observed Firing Chart Method, Part 1

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TASK NUMBER: 071-321-1605

DETERMINE DATA FOR SHEAF ADJUSTMENTS

CONDITIONS:

Given a section with the base mortar (No. 2) registered, FDC equipment, and a request for sheaf adjustment.

STANDARDS:

Determine firing data for sheaf adjustment to include:

1. Deflections to the nearest 1 mil with a 10-mil tolerance.

2. Range to the nearest 25 meters with a 25-meter tolerance.

3. Converting determined range to the correct charge and elevation.

PERFORMANCE MEASURES:

1. In some cases, individual weapon corrections for deflections, fuze setting, charge, and elevation are computed and applied to get a special pattern of bursts. These corrections are called special corrections.

2. The term **sheaf** denotes the lateral distribution of the bursts of two or more weapons fired together. The width of the sheaf is the lateral distance (perpendicular to the direction of fire) between the centers of the flank bursts. The front covered by any sheaf is the width of the sheaf plus the effective width of one burst. A sheaf may be in any one of the following forms (figure 1):

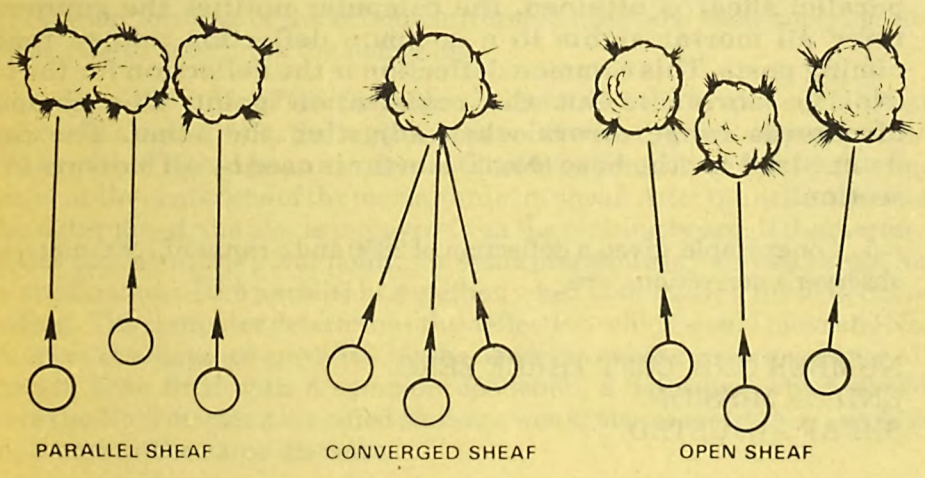

Figure 1.

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a. Parallel sheaf (normal). A parallel sheaf is one in which the trajectories of all weapons are parallel.

b. Converged sheaf. A converged sheaf is one in which the trajectories intersect at the target.

c. Open sheaf. An open sheaf is one in which the lateral distance between the center of any two adjacent bursts is equal to the maximum effective width of one and one half bursts (60 meters).

3. After registration by the base mortar, the computer directs the observer to adjust the sheaf. Although the mortars are laid parallel with a compass or aiming circle, the sheaf produced on the ground in the target area may not be parallel. This may be caused by the differences in the settling of the baseplates of the mortars or improper boresighting.

a. There are two methods to adjust the sheaf. The method used depends on the location of the observer with respect to the gun-target (GT) line (whether angle T is greater or less than 500 mils). The angle T is the difference between the azimuth of the GT line and the azimuth of the observer-target (OT) line.

b. Whenever possible, the computer selects an observer located near the GT line so that the angle T will be less than 500 mils.

4. Parallel sheaf. The computer issues a fire command to No. 1 and 3 mortars to fire a section right (or left) with the same adjusted deflection and elevation obtained by the No. 2 mortar. The observer sends back individual deviation corrections in meters for any burst that needs correcting to place it in the proper position in the sheaf. Using the mil-relation formula for the 81-mm mortar, the computer changes these corrections in meters to mils. These corrections are then applied to the deflection on the mortars. The mortars are relaid on the aiming post with this deflection. Another section right (or left) may be fired to recheck the sheaf if necessary.

NOTE: Any correction of 50 meters or more is refired. When a parallel sheaf is attained, the computer notifies the gunners to refer all mortar sights to a common deflection and to realine aiming posts. This common deflection is the deflection for the base (No. 2) mortar to hit the registration point. The computer disregards range errors when adjusting the sheaf. The range determined for the base (No. 2) mortar is used by all mortars in the section.

5. For example, given a deflection of 2850 and a range of 1,200 meters, the observer's corrections are:

NUMBER ONE, LEFT THREE ZERO
END OF MISSION
SHEAF ADJUSTED

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a. Mortar No. 3. Since no correction was reported by the observer for the No. 3 mortar, its position in the sheaf is correct. The computer determines the correction deflection for mortar No. 1 as in b, below.

b. Mortar No. 1. The observer's correction of LEFT THREE ZERO (in meters) is equal to 25 mils at a range of 1,200 meters (using the mil-relation formula); the left 25 mils is added (LARS) to the deflection setting of 2850 because the observer's correction was left and becomes 2875 mils. The computer issues the command NUMBER ONE, DO NOT FIRE, DEFLECTION TWO EIGHT SEVEN FIVE. The gunner of mortar No. 1, indexes the new deflection on the sight and traverses back onto the aiming posts. When the mortar is laid, the computer issues the following command:

SECTION
DEFLECTION TWO EIGHT FIVE ZERO
REFER
REALINE AIMING POSTS

The gunner of mortar No. 1 refers his sight to a deflection of 2850 mils and directs the No. 3 man in his squad to realine the aiming posts without moving the mortar. All mortars are then laid parallel with a common deflection of 2850 mils. Therefore, to fire a parallel sheaf on any target, each mortar of the section is given the same deflection, the one determined for the base mortar.

NOTE: If either of the other two mortars has a compensated sight picture, they would also realine aiming posts.

6. The plotting board may be used to convert the observer's corrections from meters to mils for mortars out of sheaf. This technique eliminates the need for the computer to convert the observer's correction to mils using the mil-relation formula or deflection conversion table and then applying the LARS rule to determine the deflection.

a. Procedure. The FO's correction in meters for the mortar out of sheaf is plotted as a shift from the registration point with the disk oriented on the OT azimuth. The range arm is then rotated over the plot, and the deflection is read at the centerline of the mortar(s) out of sheaf. After the deflection has been determined, the plot is removed from the plotting board. If the mortars are not plotted at the pivot point, the same procedure is followed except for the application of the parallel line method when determining the deflection-reading. The computer determines the deflection which would move the No. 2 mortar the distance specified by the observer in his correction. Since all mortars were fired with a common deflection, a deflection which would move the No. 2 mortar a specified distance would also move the No. 1 and/or No. 3 mortar the same distance.

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b. Sample problem. The section mounted on an azimuth of 2000 mils has completed registration with a range of 2,450 meters and deflection 2749 mils. The section fires for sheaf adjustment and the observer reports, NUMBER THREE, RIGHT THREE ZERO. The observer's azimuth is 2150 mils. To plot the correction, rotate the disk to the observer's azimuth and make a plot 30 meters to the right of the registration point. Rotate the range arm over the plot and determine the deflection (2737). This is the deflection which would move the No. 2 mortar 30 meters to the right. Since No. 3 mortar has the same deflection as No. 2 mortar on the sight, it will also move the No. 3 mortar 30 meters to the right.

7. Angle T over 500 mils. After the base mortar has adjusted on the registration point, the computer and the FO coordinate adjusting a converged sheaf. The computer determines the firing data to converge the sheaf on the registration point.

a. The FO adjusts each mortar except the base mortar on the registration point one at a time.

b. The computer orients the plotting board on the OT azimuth. He plots each correction with the plotting board oriented on this azimuth. He considers the registration point as the plot for the first round from each of the mortars. After each mortar completes the adjustment, erase all plots for No. 1 and 3 mortars. The computer orients the board to the GT azimuth, then places a plot 35-40 meters (the distance between mortars) left and right of the final adjusted plot for No. 2 mortar. The range arm of the M16 plotting board can be used to determine the deflection for each mortar to open the sheaf when plotting from the pivot point. To do this, rotate the range arm to the desired position to the right of the registration point and determine the deflection for the No. 1 mortar. Repeat the process to the left for the No. 3 mortar.

c. After each mortar is laid with the correct deflection to form a parallel sheaf, the section is referred to a common deflection and the aiming posts are realined.

8. Converged Sheaf. It is sometimes necessary to converge the sheaf to engage targets of a special size and shape or to enable the FDC to adjust the sheaf of a unit when the FO is more than 500 mils off the GT line. The sheaf may be converged by using the mil-relation formula or by using the plotting board.

a. Formula Method. When using the mil-relation formula, the computer converts the distance in meters between mortars to mils at the range determined by the base mortar adjustment of the registration point or target. He applies the number of mils to the deflection of each mortar other than the base mortar, using the LARS rule.

b. Plotting Method. The computer determines the deflections for mortars No. 1 and No. 3 to hit the registration point. To do this, the computer alines the registration point plot with each mortar position and reads the

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deflection at the index mark. The mortar unit position plot on the disk represents the No. 2 (base) mortar of the unit. To determine the deflection for each of the other mortars, use either of the following methods:

(1) When the mortar position is located below the pivot point, the location of the No. 1 and 3 mortars can be plotted with respect to the base mortar. Do this by rotating the disk to the mounting azimuth (the section front is usually perpendicular to the mounting azimuth) and plotting the positions of No. 1 and 3 mortars 40 meters right and left of the dot on the index line (representing the No. 2 mortar).

(2) When the mortar position is located at the center of the plotting board, the pivot point obscures part of the grid. To determine the deflection for each mortar, the computer rotates the disk until the mark representing the desired location of the initial burst from each of the mortars appears as follows:

(a) No. 1 -- 35-40 meters right of the index line (the distance between mortars).

(b) No. 2 -- on the index line.

(c) No. 3 -- 35-40 meters left of the index line.

9. Open Sheaf. To open the sheaf, the FDC reverses the procedure as outlined in paragraph 8 above. For example, to converge No. 1 mortar, the FDC adds to the No. 2 mortar's deflection. To open the sheaf, he would subtract from the No. 2 mortar's deflection, and vice versa for No. 3 mortar.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 15, page 15-7, para 15-6)
TEC Lesson 071-071-6605-F, FDC: Observed Firing Chart, Part IV

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TASK NUMBER: 071-321-1606

DETERMINE DATA FROM RE-REGISTRATION AND APPLICATION OF CORRECTIONS

CONDITIONS:

Given a registration point and a directive to re-register and to determine the corrections to apply, FDC equipment, and firing data sheet.

STANDARDS:

Determine firing data for re-registration and apply corrections to include:

1. Determining deflections to the nearest 1 mil with a 10-mil tolerance.
2. Determining range to the nearest 25 meters with a 25 meter tolerance.
3. Converting range to correct charge and elevation.
4. Replotting target locations.
5. Posting corrections to firing data sheet.

PERFORMANCE MEASURES:

1. The corrections determined from the initial registration will generally be valid for only a few hours. Changing weather, further settling of the baseplates, changes in ammunition temperature, and other factors tend to invalidate them. Therefore, every 3 to 5 hours, or after any great weather change, firing correction should be verified and updated if necessary. One way of doing this is the re-registration, in which the same registration point(s) is refired to determine how much firing corrections have changed.

2. The observer's corrections are plotted and data is computed and sent to the section. When the observer splits a 50-meter range bracket, he announces END OF MISSION, RE-REGISTRATION COMPLETE with his correction. The computer computes the final firing data, but it is not sent to the section. END OF MISSION is sent to the section. The chief computer may adjust the sheaf again if he has reason to suspect it, but generally this is not done.

3. Corrections must be determined for both range and deflection. To determine the new RCF to be applied to new targets and to update firing data for previously fired targets on the data sheet, you must use data from both the registration and the re-registration as follows:

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a. RP adjusted range 3225 (Range fired)
Altitude corrections (-)+ 20 (Reverse sign to strip out)
3245 (Altitude stripped out)

3245 meter, range fired during re-registration to hit RP, minus altitude correction.

b. Determine range difference:

RP re-registration adjusted range	3245
RP registration chart range	3175
Range difference	+70

(Adjusted range is greater than chart range; the sign is a +)

c. To determine the new range correction factor (RCF), you must divide the range difference (+70) by the range to the RP expressed in thousands (3245 becomes 3.2).

$$3.2\overset{\wedge}{)}\overline{70.0\overset{\wedge}{0}} = +22 \text{ RCF}$$

64
60
32
280

(3.2 is chart range to RP expressed in thousands)

NOTE: When dividing by a decimal number, the placement of the decimal point in the answer is all-important. To be sure it is placed correctly, remember that before dividing by a decimal number divisor (such as 3.2), the decimal point must first be moved to the right of that entire number, to make the divisor a whole number (in this case, past the digit 2; thus, 3.2 becomes "3 2.". (The caret (∧) merely indicates that a decimal point has been moved.) Remember, as a second step, that the decimal in the dividend (such as 70.) must also be moved to the right the same number of spaces as it was moved in the divisor. Thus, in this example, 70. as a dividend becomes "70.0∧"; the added zero represents the space the decimal was moved in the divisor. As the third and final step, always place the decimal point in the answer directly above the caret (∧) in the dividend.

d. To determine the new deflection correction, determine the difference between the re-registration adjusted deflection and the initial registration chart deflection. If the re-registration adjusted deflection is larger than the initial registration chart deflection, the deflection correction is a plus; if it is smaller, the deflection correction is a minus.

EXAMPLE:

On initial registration, the RP chart deflection was 2784. Several hours later, a re-registration was conducted and the RP was hit with an adjusted

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deflection of 2769. The deflection correction is determined as follows:

2784-2769 = 15

Since the re-registration adjusted deflection is smaller than the initial registration chart deflection, the deflection correction is a minus (-15). For 81-mm mortars, this -15 is applied to all deflections regardless of range to other targets.

e. To determine the data to hit new targets and to update firing data for previously fired targets, the RCF and deflection correction must be applied to data to hit the target.

EXAMPLE:

Target AB101 was hit earlier with a chart range of 1875 meters and a chart deflection of 2681. The new data would be determined as follows:

RANGE: Chart range (1875) rounded to nearest hundred (1900) expressed in thousands of meters (1.9) multiplied by the new RCF +22, 1.9 x 22 = +42; 1875 + +42 = 1917 meters (round to nearest 25 meters for 81-mm mortar).

DEFLECTION: Chart deflection 2681 plus the new deflection correction -15, 2681 + -15 = 2666.

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 15, page 15-25, para 15-31)

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TASK NUMBER: 071-321-1607

RECORD INFORMATION ON FIRING DATA SHEET (81-MM)

CONDITIONS:

As the fire direction computer for an 81-mm mortar platoon, given a pencil, DA Form 2188-R (blank), 1:50,000 map, location of OP and mortar section, and completed computer record(s) (DA Form 2399).

STANDARDS:

Complete all information on the data sheet (DA Form 2188-R) with no errors.

PERFORMANCE MEASURES:

1. The data sheets are used to record and maintain up-to-date information and firing data for targets. These may be targets previously fired and of sufficient significance to maintain data on, or preplanned targets upon which fires are scheduled or data maintained on call. When firing corrections are updated through re-registration or the computation of MET corrections, all targets are updated to reflect current firing conditions. DA Form 2188-R (figure 1) will be locally reproduced on 10½ x 8 inch paper.

2. Data sheets are completed as follows:

a. ORGANIZATION. Identification of the unit firing.

b. MORTAR GRID. Survey coordinates of section center.

c. MORTAR ALT. Altitude of section, if known.

d. DATE. The date on which the data on the sheet is current.

e. DIR OF FIRE. The direction of fire (to the target) determined for the mortar.

f. DRIFT. Recorded for 107-mm mortar.

g. MT AZ. Mounting azimuth, as determined from direction of fire.

h. OP GRID/OP ALT. The known coordinates and altitudes of OPs are recorded here.

i. RCF. The range correction factor, when known.

j. DEFL CORR. The deflection correction, when known.

k. GRID INT. The grid intersection, after it is determined.

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DATA SHEET

For use of this form, see FM 23-91, the proponent agency is U S Army Training and Doctrine Command

ORGANIZATION A Co 1/66 MORTAR GRID 01457805 MORTAR ALT 250 DATE 12 MAY 77

DIR OF FIRE 5130 OP GRID 1 01157816 OP ALT 1 325 RCF -37

DRIFT — 2 01557850 2 400 DEFL CORR R18

MT AZ 5150 3 01687875 3 300 GRID INT 0180

TARGET IDENT		CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE			
TGT NO	GRID	DEFL	RG / CHG	DEFL CORR	RG CORR	ALT / Vi	ALT CORR	DEFL	RG / CHG	FUZE TIME SETT	ELEV	TIME FIRED	TARGET DESCR	METH OF ENGMT	SURVEIL LANCE
RP1	0045 7878	2848	1225	R18	-44	150 / -100	-50	2830	1125 / 1	0	1167	0715	RP	Sec ① S/L	REG COMP
AB101	0110 7895	2465	1025	R18	-37	250 / 0	0	2447	1000 / 1	0	928	0910	PLT IN OPEN	Sec ⑤	EST 10 CAS
AB102	0090 7835	3057	600	R18	-22	300 / +50	+25	3039	600 / 1	0	1285	1050	SQD PATROL	Sec ③	EST 3 CAS

Figure 1.

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l. TARGET IDENT. The target number and 8-digit coordinates locating it on the plotting board.

m. CHART DATA. The chart deflection, charge, and range.

n. FIRING CORRECTIONS. Deflection correction, range correction, altitude of the target, vertical interval, and altitude correction.

o. FIRING DATA. The most current firing data, in a form suitable for transmission to the section — namely, deflection, range, change, fuze time setting (if used), and the elevation.

p. INTELLIGENCE. Information which may be of value for future reference by the FDC or the S2. The time-fired block is used for the time the call for fire was received. Target description, method of engagement, and surveillance are self-explanatory (figure 1).

REFERENCES:

***FM 23-91, Mortar Gunnery**
TEC Lesson 010-071-6604-F, The Observed Firing Chart (Part III)

***FM 23-91 is currently under revision and does not currently cover all the material presented in this task summary.**

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TASK NUMBER: 071-321-1620

DETERMINE FIRING CORRECTIONS

CONDITIONS:

Given the altitude of mortar position and target, chart deflection, chart range, adjusted deflection, and adjusted range.

STANDARDS:

Determine correction to include:

1. Altitude correction within 1 meter.
2. Range difference to nearest 25 meters.
3. Range correction factor (RCF) to within 1 meter.
4. Deflection correction to within 1 mil.

PERFORMANCE MEASURES:

1. **Altitude Corrections.**

a. Modified-observed firing chart (M16 plotting board).

(1) When using altitude corrections with the modified-observed chart, the altitude of the mortar and the target(s) must be determined.

(2) To determine the altitude correction, take half of the altitude difference.

EXAMPLE: Mortar altitude 450 meters
Target altitude 400 meters
50 altitude difference

50 ÷ 2 = 25 meters altitude correction

NOTE: Altitude corrections will be used on the modified-observed chart only when the altitude difference is 50 meters or more.

(3) To apply the altitude correction to the range to a target, you must determine if the correction is a plus (+) or minus (-). If the target is lower than the mortar, the correction is a minus correction. If the target is above the mortar, the correction is a plus (+). In the example, the target is lower than the mortar position which would make the correction a minus (-) 25.

(4) The altitude correction will be applied to the range for each round fired in adjustment and the FFE (figure 1).

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COMPUTER'S RECORD

For use of this form, see FM 6-[illegible]; the proponent agency is [illegible]

ORG	DATE	TIME	LOT NO
A 1/66	10 June	0830	RPI

VT	CHG FOR CORR	CHART DEFL	MAGT DF
-25	—	2818	1825/-25 = 1800

DEFL CORR	ANGLE T	FUZE
—	—	3

CALL - FOR FIRE	FDC ORDER	INITIAL FIRE COMMAND	RDS EXP
FIA25 Adjust Fire Dir 0870 Reg	MORT TO FFE ... Sec MORT TO ADJ ... #2 METH OF ADJ ... 1 Rd BASIS FOR CORR ... SHEAF CORR ... SHELL & FUZE ... HEQ ... METHOD OF FFE ... RG LATERAL SPREAD ... ZONE ... TIME OF OPENING FIRE ... W/R	MORT TO FFE ... Sec SHELL & FUZE ... HEQ MORT TO FIRE ... #2 METHOD OF FIRE ... 1 Rd ... DEFLECTION ... 2818 CHARGE ... 3 ... TIME SETTING ... ELEVATION ... 1014	(1)

OBSERVER CORR			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RG	(TIME HEIGHT)	DEFL	CHG (RG)	MORT FIRE	METHOD FIRE	DEFL	RG CHG	TIME SETTING	ELEV	
L30	+200		2850	2000			2850	1975		849	(2)
	-100		2843	1925			2843	1900		941	(3)
	-50		2840	1875			2840	1850		981	(4)
L10	+25	EOM Reg Comp	2844	1900			2844	1875		962	

AMMUNITION

LOT NUMBER										
TYPE										
ON HAND										
RECEIVED										
TOTAL										
EXPENDED										
REMAINING										

DA FORM [illegible] 2399-R

Figure 1.

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NOTE: When working with a surveyed chart and using firing correction, use half of any altitude difference.

2. **Range and Deflection Corrections.**

a. Firing data corrections can only be determined when the M16 plotting board is set up and used as a surveyed chart. This means there must be a valid 8-digit coordinate for the mortar position and the registration point.

b. When the mortars and registration point are plotted using valid 8-digit coordinates, the mortars should be able to shoot and hit the target with the first round, but due to weather and wear of equipment, this just won't happen. However, there is a way to compensate for this by using firing corrections for range and deviation.

c. As a registration mission is fired and completed, the rounds on the plotting board are not plotted at the point where the RP was plotted (figure 2). Due to wind and weather, the rounds have to be shot at a little greater range and a little to the right of the target in order to hit it (figure 2).

EXAMPLE: Let's say you are playing ball and you are in center field. You have been throwing the ball into 2d base without problems, but suddenly a strong wind starts blowing from homeplate into your face. A ball is hit to you and you pick it up and throw to second base, but it falls short. What was the problem? The wind was holding the ball back. You now know that in order to get that ball to 2d base next time, you will have to throw harder, which is just what firing corrections will do for the mortars.

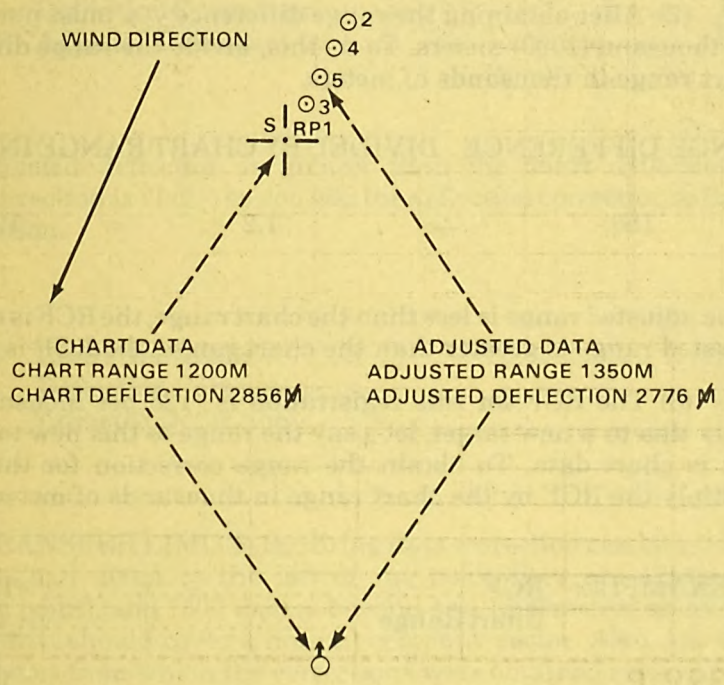

Figure 2.

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d. To determine firing corrections, you must first obtain the initial deflection and the initial range to the target or registration point. This is "chart data" taken from the plotting board. Record this data; then continue the mission until the target is destroyed or the registration is complete.

e. The last data computed to hit the target is "adjusted data." "Adjusted data" and "chart data" will differ. This difference is where you will obtain the firing data corrections, to apply to new targets.

f. After determining the "adjusted data" to hit the target, you must take this and the "chart data" and work out the firing corrections to apply to other targets.

g. Referring to figure 2, we have this data:

CHART DATA	ADJUSTED DATA
Chart Range -- 1200 meters	Adjusted Range -- 1350 meters
Chart Deflection -- 2856~~p~~ (mils)	Adjusted Deflection -- 2776~~p~~ (mils)

NOTE: If any altitude correction was used during adjustment, it must be removed prior to determining range difference.

(1) To determine the "Range Correction Factor" (RCF), subtract the smaller range from the larger range.

Adjusted Range (minus altitude correction) .... 1350 meters
Chart Range ..... 1200 meters
Range Difference ..... 150 meters

(2) After obtaining the range difference you must now find the RCF per thousand (1000) meters. To do this, divide the range difference by the chart range in thousands of meters.

RANGE DIFFERENCE DIVIDED BY CHART RANGE IN THOUSANDS

150 ÷ 1.2 = 125m RCF

If the adjusted range is less than the chart range, the RCF is minus (-). If the adjusted range is greater than the chart range, the RCF is plus (+).

(3) The RCF for this registration is +125 per thousand meters. To apply this to a new target, let's say the range to this new target is 1500m; this is chart data. To obtain the range correction for this new target, multiply the RCF by the chart range in thousands of meters.

EXAMPLE: RCF ..... +125
Chart Range 1.5
625
125
Range Correction ..... 187.5 = 188m

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This +188m is added to the chart range of 1500m, which gives a range of 1688m, this is rounded off to the nearest 25 meters, in this case 1700m is the range to fire to hit this target.

(4) To determine the deflection correction to apply to new targets, subtract the smaller deflection from the larger deflection. In figure 2, the chart deflection was 2856mils and the adjusted deflection was 2767mils.

EXAMPLE:
Chart Deflection	2856mils
Adjusted Deflection	2776mils
Deflection Correction	80mils

(5) To apply deflection correction, you must use the LARS rule (left add, right subtract).

If the adjusted deflection is less than the chart deflection, the deflection correction is "right", so you must subtract the deflection correction from the deflection to your new target.

EXAMPLE:
Chart Deflection	3036mils
Deflection Correction	R 80mils
Adjusted Deflection	2956mils

If the adjusted deflection is greater than the chart deflection, the deflection correction is "left", so you add the deflection correction to the new target deflection.

EXAMPLE:
Chart Deflection	3036mils
Deflection Correction	L 80mils
Adjusted Deflection	3116mils

(6) TRANSFER LIMITS; the firing data correction can be used 400mils to the right and 400mils to the left of the point they are obtained for (registration point), and 1500 meters beyond and 1500 meters short of this point. This area should cover a normal company sector. Also, you should fire on the point from which the corrections were obtained several times a day or any time the weather changes. This way you can keep the firing data corrections up to date (figure 3).

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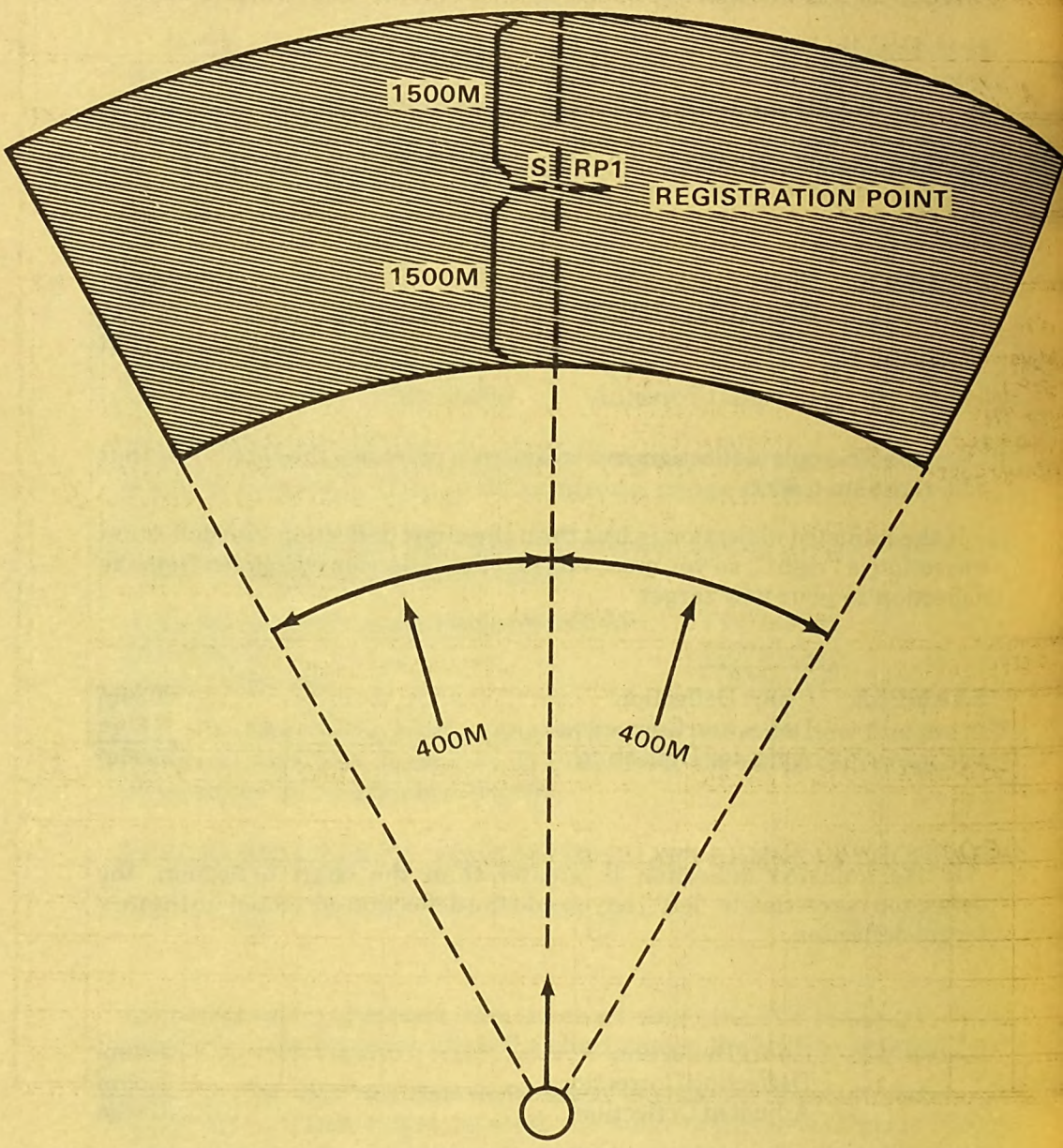

Figure 3. Transfer limits.

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NOTE: To apply corrections, see figure 4.

COMPUTER'S RECORD

For use of this form, see FM 23-91, the proponent agency is U. S. Continental Army Command

ORG	DATE	TIME	TGT NO.
A 1/66	10 June	1245	AB 110

+30 = +15	CHG RG CORR (RCF +125) +175	CHART DEFL 2952-80 = 2872	CHART RG 1575 (1375 + 175 + 15 = 1565
DEFL CORR R80		ANGLE T 60	CHG 3

CALL FOR FIRE	FDC ORDER	INITIAL FIRE COMMAND	RDS EXP
FIA 25 Adjust Fire Shift RP 1 Dir 0910 L100 + 200 MG w/o Cover	MORT TO FFE #2 MORT TO ADJ #2 METH OF ADJ 1 Rd BASIS FOR CORR RP 1 SHEAF CORR SHELL & FUZE HEQ METHOD OF FFE 5 Rds RG LATERAL SPREAD ZONE TIME OF OPENING FIRE W/R	MORT TO FOLLOW #2 SHELL & FUZE HEQ MORT TO FIRE METHOD OF FIRE 1 Rd 5 Rd in FFE DEFLECTION 2872 CHARGE 3 TIME SETTING ELEVATION 1129	①

OBSERVER CORR			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RG	TIME HEIGHT	DEFL	CHG (RG)	MORT FIRE	METHOD FIRE	DEFL	RG / CHG	TIME SETTING	ELEV	
	-50	FFE	2951	1325		5 Rds	2871	1525		1150	⑥
	EOM		MG Destroyed Est 3 CAS								

Figure 4.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 15, page 15-26, para 15-32)

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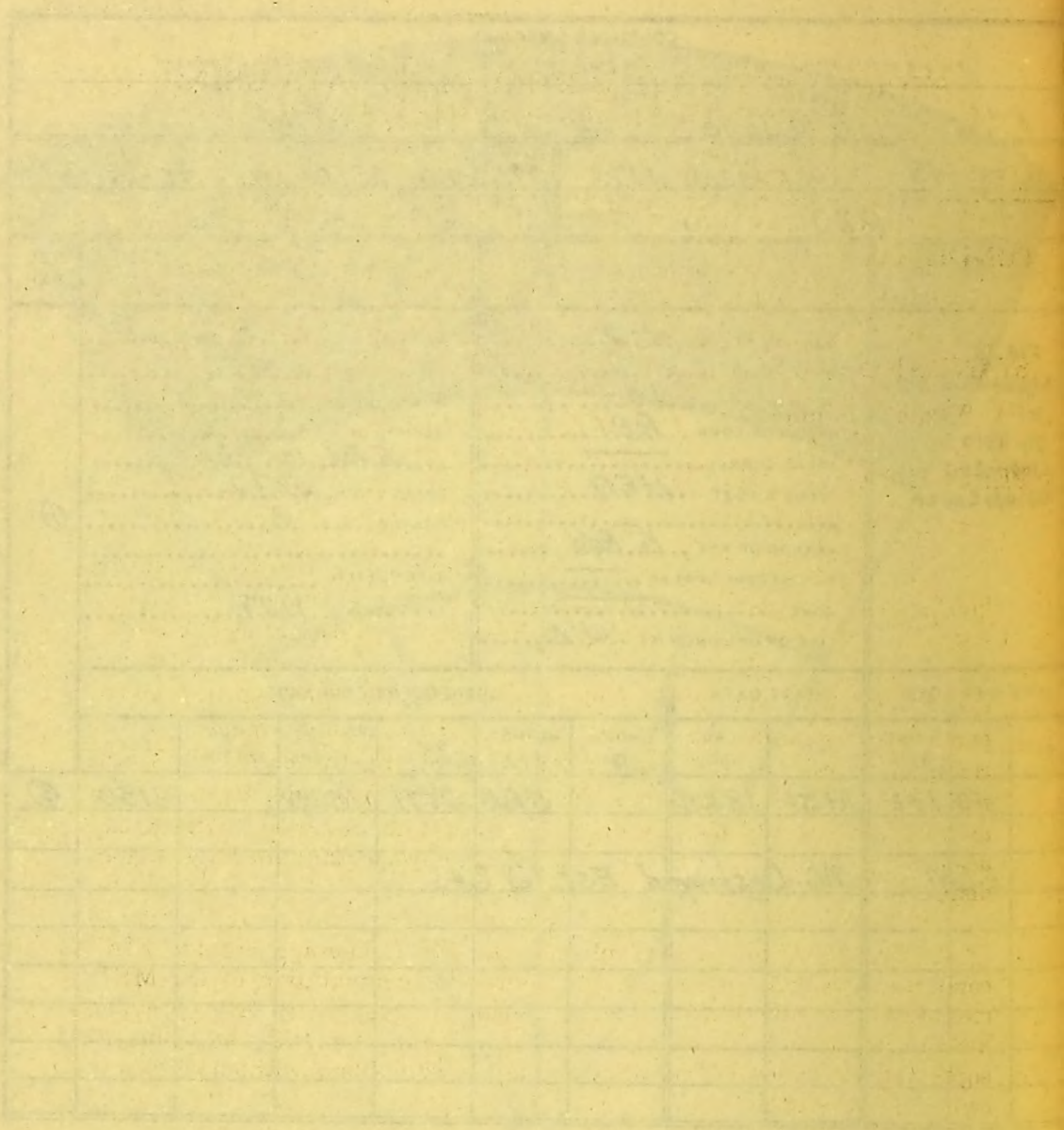

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TASK NUMBER: 071-321-1621

RECORD METEOROLOGICAL (MET) DATA USING MET DATA SHEET (81-MM MORTAR)

CONDITIONS:

Given DA Form 3675 and MET message.

STANDARDS:

Within 15 minutes, record MET message on DA Form 3675 without error.

PERFORMANCE MEASURES:

1. **The Ballistic MET Message.**

a. To place fire on a target without adjustment, a mortar unit must know the exact location of the target, and be able to compensate for all nonstandard conditions. The re-registration is the most accurate method for determining and maintaining current firing corrections, but re-registration is not always practical. The ballistic MET message provides a means of determining the corrections necessary for changes in many of the conditions that affect the flight of rounds during the periods between registrations. These conditions include changes in powder temperature, air temperature and density, and the speed and direction of the wind, assuming that all other factors remain relatively constant until the section displaces.

b. The following paragraphs on the MET message provide FDC computers with the rules and procedures for computation of the MET message. For the 81-mm mortar, firing tables FT 81-AI-3 provide MET information for M374A2 and M375A2 ammunition. In general, plus (+) signs have been omitted from the firing tables; numbers without signs are considered positive.

c. By themselves, corrections computed from the MET message are not adequate firing corrections. To be of value to the FDC, a valid MET message must be received concurrently (within 4 hours) with a registration. The registration corrects for all nonstandard conditions; a MET received and computed concurrently with the registration tells the FDC how much of the total registration correction is attributable to weather. By comparing the corrections obtained from a later MET message, the FDC can modify the registration corrections to account for changes in weather. The use of MET corrections therefore eliminates the need for re-registration.

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d. The ballistic MET message (figure 1) has two parts: the introduction, which identifies and describes the MET station, and the body, which contains meteorological data. MET messages can normally be obtained from the division artillery MET station every 4 hours. Since MET information is normally broadcast on AM radios, it will come to the FDC through battalion headquarters.

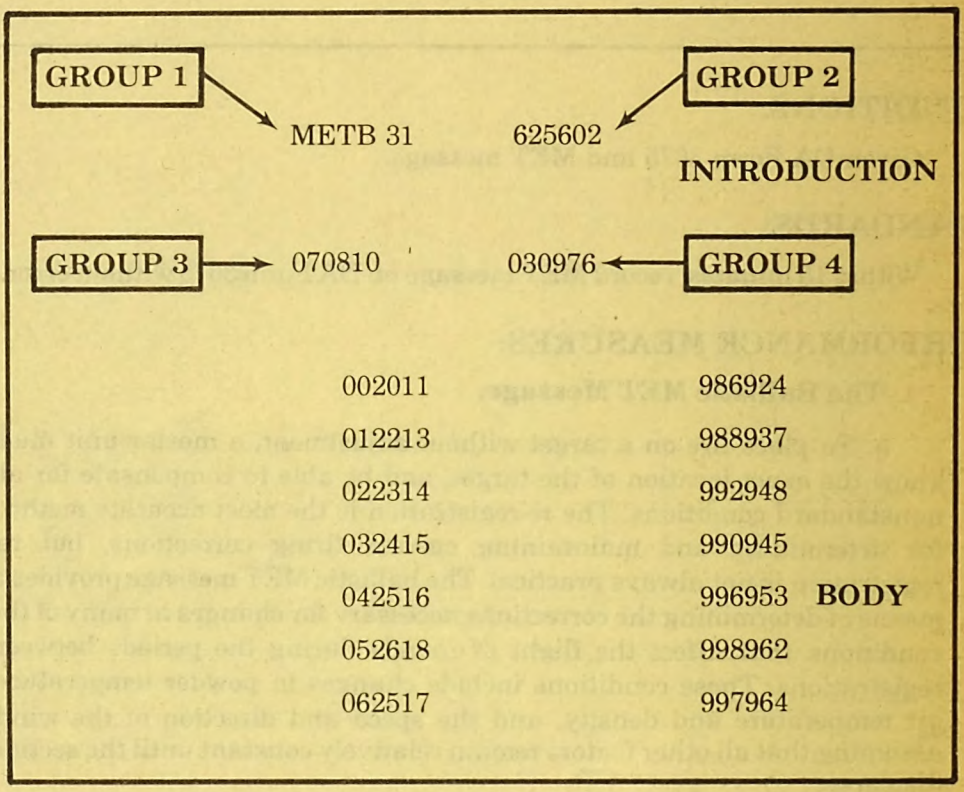

Figure 1. Sample ballistic MET message.

2. **Recording the MET Message** (DA Form 3675).

a. Format of the MET Message. The MET message is broadcast in 6-character blocks, as shown in figure 2. The first four 6-character groups are known as the introduction, and are recorded on the top line of the recording form. The rest of the message is the body; two 6-character groups comprise each line of the body.

b. Introduction. The first four 6-character groups of the MET message are the introduction, identifying the type of message and the station transmitting the message. The recording of the introduction on DA Form 3675 (Ballistics MET Message) (figure 2), is discussed below. For a more detailed description of the meaning of each of the characters which make up the introduction, see the introduction section of the firing tables. The meaning of the characters in the introduction recorded in figure 1 follows:

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BALLISTIC MET MESSAGE

For use of this form, see FM 6-15, the proponent agency is United States Continental Army Command.

IDENTIFICATION	TYPE MSG	OCTANT	LOCATION $L_aL_aL_a$ or xxx	LOCATION $L_oL_oL_o$ or xxx	DATE	TIME (GMT)	DURATION (HOURS)	STATION HEIGHT (10's M)	MDP PRESSURE % OF STD
METB	K	Q			YY	$G_oG_oG_o$	G	hhh	PPP
METB	3	1	625	602	07	081	0	030	976

ZONE HEIGHT (METERS)	LINE NUMBER ZZ	BALLISTIC WINDS DIRECTION (100's MILS) dd	BALLISTIC WINDS SPEED (KNOTS) FF	BALLISTIC AIR TEMPERATURE (% OF STD) TTT	BALLISTIC AIR DENSITY (% OF STD) △△△
SURFACE	00	20	11	986	924
200	01	22	13	988	937
500	02	23	14	992	948
1000	03	24	15	990	945
1500	04	25	16	996	953
2000	05	26	18	998	962
3000	06	25	17	997	964
4000	07				
5000	08				
6000	09				
8000	10				
10000	11				
12000	12				
14000	13				
16000	14				
18000	15				

REMARKS

DELIVERED TO: RECEIVED FROM:	TIME (GMT)	TIME (LST)

MESSAGE NUMBER	DATE

RECORDER	CHECKED

DA FORM 1 JAN 71 3675 REPLACES DA FORM 6-57, 1 MAR 62, WHICH IS OBSOLETE.

Figure 2.

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METB 31 (Group 1)

MET	Indicates that the transmission is a meteorological message.
B	Indicates that it is a ballistic MET message.
3	Indicates that the message is for surface-to-surface fire.
1	Indicates the octant of the globe in which the meteorological message is applicable.

625602 (Group 2)

625	Indicates the latitude of the center of the area of applicability expressed to the nearest tenth of a degree.
602	Indicates the longitude of the center of the area of applicability expressed to the nearest tenth of a degree. When the longitude is 100 degrees or greater (possible when in octant 1, 2, 6, or 7), the initial digit, 1, is omitted.

070810 (Group 3)

07	Indicates the day of the month the period of validity of the message begins; 07 = the seventh day of the month.
081	Indicates, to the nearest tenth of an hour in Greenwich Mean Time, the hour the period of validity begins.
0	Indicates the duration of the period of validity in hours. For US Armed Forces, the meteorological data is presumed valid until a later message is provided.

030976 (Group 4)

030	Indicates the altitude of the MET station (also referred to as the meteorological datum plane, or MDP), recorded in tens of meters. The altitude should be written on the recording form exactly as it is received to avoid confusion; 049 written on the sheet means 490 meters.
976	Atmospheric pressure at the MET station. This value is not used to determine MET corrections for mortars, but is recorded to avoid confusion in recording the message.

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c. Body. The atmosphere is divided into height zones parallel to the meteorological datum plane, as depicted in figure 3. Meteorological conditions are determined for each height zone and recorded in two 6-digit groups. The data for each zone is numbered, beginning at 00 for the zone containing the MET station, and recorded on the line bearing the corresponding number. The data for line C3 is shown below as an example.

032415

03 ..... The first two digits of any line in the body of the MET message indicate its line number. These numbers run sequentially from 00 (surface conditions) up to 15 (18,000 meters); however, with present ammunition only lines 00 through 06 are used since mortar projectiles never exceed the zone height corresponding to line 06. Record the entire MET message to reduce the chance of omitting significant data.

24 ..... Indicates the direction from which the ballistic wind is blowing. It is a grid azimuth expressed in hundreds of mils, e.g., 24 = 2400 mils.

15 ..... Indicates the speed of the ballistic wind expressed to the nearest whole knot; 15 = 15 knots.

990945

990 ..... Indicates the ballistic air temperature expressed to the nearest 0.1% of standard. When the value is equal to or greater than 100, the initial digit, 1, had been omitted in transmission. The computer recording the message may add the 1 for clarity if he desires to do so. Here, 990 = 99.0%.

945 ..... Indicates the ballistic air density expressed to the nearest 0.1% of standard. As with temperature, the initial 1 is omitted in transmission when the value equals or exceeds 100.0. In this case, 945 = 94.5%.

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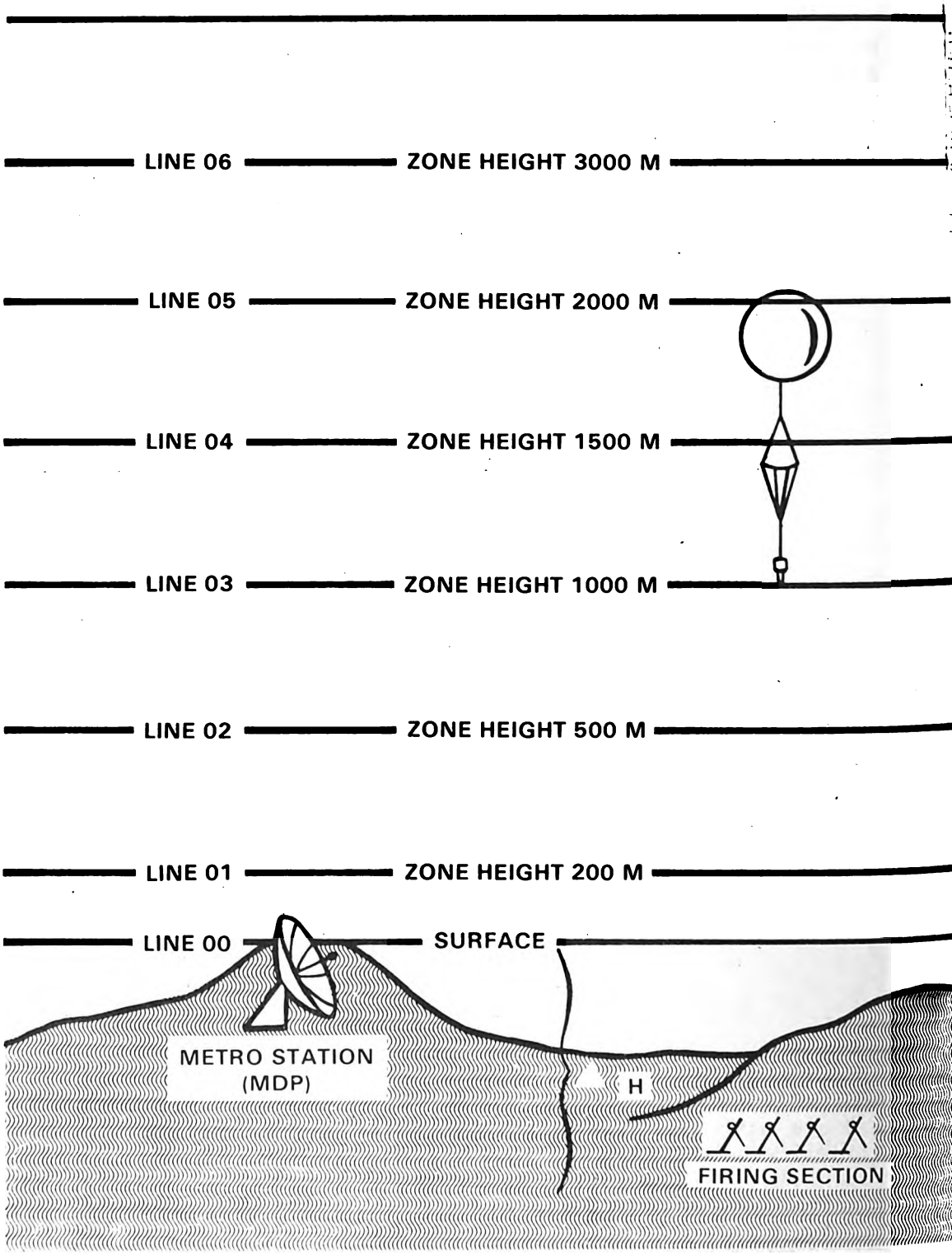

Figure 3. Zone height and difference in height.

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d. Corrections and Omissions. At the end of the transmission of a MET message, the recorder checks to see that his copy is complete. The format of the message enables the recorder to ask for a repetition of only the part he has missed, as in SAY AGAIN INTRODUCTION, or SAY AGAIN LINE 04. When his copy is complete, the recorder reads back the entire message to check it for errors. If line 05 has been recorded incorrectly, the transmitting station would catch the error and report WRONG, LINE 05: 052618 998962.

REFERENCE:

FT 81-AI-3, Firing Table, 81-mm Mortar, Jan 73 (page XVI, para 6)

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TASK NUMBER: 071-321-1622

DETERMINE AND APPLY MET FIRING CORRECTIONS (81-MM MORTAR)

CONDITIONS:

Given DA Form 2601-1, completed DA Form 3675, and tabular firing tables.

STANDARDS:

Within 60 minutes, record and compute MET data corrections to apply to the nearest 1 mil for deflection and 1 meter for range.

PERFORMANCE MEASURES:

DA Form 2601-1 (Computing MET Data Corrections Sheets for Mortars) (figure 1).

1. **Known Data.** Known data is that which is available to the FDC prior to the receipt of a MET message. It is collected by the computers and recorded in the proper spaces on the MET data correction sheet. Known data consists of the following items:

a. Charge. This is the most up-to-date firing data charge on the data sheet for the RP. This charge determines which line of the firing tables is consulted to determine the correction factors to be used, and which line of the MET message to use.

b. Chart Range. For purposes of applying MET corrections, the chart range is the distance measured on the firing chart between the plotted locations of the mortars and the RP.

c. Elevation. The elevation used to determine the adjusted charge; corrections will be taken from the same section of the firing tables.

d. Direction of Fire. For use with the MET measured to the nearest 10 mils, from the mortars to the plotted location of the RP, rounded to the nearest 100 mils. It is measured from the firing chart -- or with a surveyed chart, it may be read from the mounting information at the top of the data sheet.

e. Altitude. The altitude of the firing section is read from the data sheet, rounded to the nearest 10 meters, and recorded in the proper box.

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f. Powder Temperature. The temperature of the ammunition propellant at the section is measured to the nearest degree Fahrenheit or centigrade. If the propellant temperature cannot be determined, air temperature can be substituted.

2. **Computation.** Once the known data has been recorded on the MET data correction sheet, the transmission of the MET message is awaited. The computation of the MET corrections is quick and more accurate if the computer has organized his thoughts and data before the message is received. Figure 1 shows a MET data correction sheet which indicates the sources, movements, and precisions of the data recorded on the sheet. The following is a guide for organizing MET computations:

a. Any known data not previously recorded should be written in the proper spaces prior to receipt of the MET message.

b. Enter the proper subsection of the firing tables, at the charge and command range (table D); read across to find which line of the MET message to use (column 5).

c. After the MET message is received and recorded on DA Form 3675, extract the information contained in the introduction of the message and in the line of the body determined above, and record this information in the proper spaces of the MET data correction sheet.

d. Compute corrected values for air temperature and density; determine the chart direction of the wind and the corresponding wind components; and compute the deflection correction.

e. Compute the MET range correction.

f. The corrections for deflection and range are rounded to the nearest 1 mil and 1 meter, respectively, and recorded in the THIS MESSAGE box at the bottom to determine the correction to apply.

3. **Example.** The following known data will be used to compute corrections.

Adjusted range 2600
Charge 6
Elevation 1144
Direction of fire 1400
Section altitude 210
Ammunition M374A2
Propellant temperature ..... 53 degrees F

4. **Procedures for using DA Form 2601-1 to compute MET corrections.**

a. Known Data. Record all known data in the spaces provided.

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81-mm MORTAR

MET DATA CORRECTION SHEET FOR MORTARS

For use of this form, see FM 23 – 91, the proponent agency is U. S. Continental Army Command

COMMAND DATA			MET MESSAGE			
CHARGE: DATA Sheet	CHART RANGE: DATA Sheet	ELEVATION: DATA Sheet	TYPE: Met Message	STATION: Met Message	DATE: Met Message	
ALT OF MORTARS (m):		DATA Sheet	TIME: Met Message	ALT MDP: Met Message	LINE NUMBER: Table D, Col 5	
ALT OF MDP:			WIND DIRECTION: Met Message	WIND VELOCITY: Met Message	AIR TEMP: Met Message	AIR DENSITY: Met Message
ABOVE + SECTION MDP Δ H BELOW –		+ subtract altitude of Mort – and MDP	Δ H CORRECTIONS: From Table B		Δ^T + Table B	Δ^D + Table B
			CORRECTED VALUES		Sum of two Boxes above	Sum of two Boxes above

WIND COMPONENTS AND DEFLECTION CORRECTION

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	6400
DIRECTION OF WIND	Met Message
DIRECTION OF FIRE: Round to nearest 100 mils	From Plotting Board
CHART DIR OF WIND: Use to enter Table A	

CROSS WIND: Met Message VELOCITY × L R Table A COMPONENT = L R Round to Nearest 1/10 Knot LATERAL WIND KNOTS × Table D Col 7 CORR FACTOR = Round to Nearest whole DEFL CORR

RANGE WIND: Met Message VELOCITY × T H Table A COMPONENT = T H Round to Nearest 1/10 Knot RANGE WIND KNOTS

MET RANGE CORRECTIONS

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARDS	UNIT CORRECTIONS	PLUS	MINUS
POWDER TEMP	ΔV – Table C	0	C I Round to Nearest 1/10	Table D Col 8 & 9	Round	
RANGE WIND	T H	0	T H "	Table D Col 10 & 11	Results	
AIR TEMP	Corrected Value	10	D I "	Table D Col 12 & 13	To The	
AIR DENSITY	Corrected Value	1.00	I "	Table D Col 14 & 15	Nearest	
WT OF PROJECTILE	Do not use ☐	☐	D I		Whole	Meter
				TOTAL	Substract	
					Smaller	
				RANGE CORR	From Larger	

MET CORRECTION TO APPLY

	DEFL	RANGE
LAST MESSAGE	L R	+ –
THIS MESSAGE	– R	+ Nearest – 1 Meter
CORR TO APPLY	L R	+ –

DA FORM 2601-1

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

Figure 1. MET Data Correction Sheet for Mortars.

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b. Determination of Line Number. (See figure 5). Enter Part I-6 of the firing tables, the section for charge 6, and search down column 1 until the adjusted range (2600) is found. Read across to column 5 to determine the line number of the MET message to use (in this case, 4).

c. MET Values. Record the data from the introduction and the appropriate line (04) of the MET message in the proper spaces on DA Form 2601-1 (figure 2). For brevity, the location of the MET station should remain as it appears in the MET message. All other data should be changed from 030 to 300; wind direction, from 25 to 2500. Values for the altitude of the MET station, wind direction, and wind speed are used in other sections of the sheet, and should be recorded in these other sections at this time.

d. Temperature and Density Corrections. Determine H and corrected values for air temperature and density. H is the difference in altitude between the mortar section and the MDP; the sign is plus if the section is above the MDP and minus if it is below:

Altitude of the MDP	300
-Altitude of mortars	210
H	-90 (Section below MDP)

The H corrections modify the values of air temperature and density determined at the MET station to what they would be at the mortar section. The value for H is used to locate the appropriate corrections in table B (figure 3). Corrections for air temperature (T) and air density (D) are arranged in four double rows in the table. The numbers 0, +100-, +200-, +300-, located in the left column of the table represent H expressed in hundreds of meters; the numbers 0, +10-, through +90- across the top represent H in tens of meters. Where the proper hundreds row crosses the proper tens column, the corrections may be found. The numerical sign of the corrections will be the opposite of the sign of H. In the example H = 90, the corrections are found where the 0 row crosses the +90- column. The sign of H is minus, making the corrections plus: T is +0.2 and D is +0.9. Enter these in the spaces provided on the form and determine the corrected values for temperature and density (figure 2).

e. Wind Components. The wind direction should already have been entered in the proper space, and also the direction of fire. (If the direction of fire is larger than the direction of the wind, add 6400 to the latter (4300 is larger than 2900; 2900 + 6400 = 9300).) Subtract the direction of fire; the result is the chart direction of the wind (9300 - 4300 = 5000). In this message the direction of fire is less than the direction of the wind. Enter table A (figure 4) and find the chart direction of the wind. Read across that row to find the crosswind and range wind components (RIGHT .88 and HEAD .47); copy these in the proper spaces (figure 2). Multiply the components by the wind speed to get lateral wind and range wind. The crosswind (16 x .88 = R14.1) is multiplied by the correction factor corresponding to the adjusted range (2600) taken from table D (basic data), column 7 (1.4, figure 5) to get the deflection correction (R14.1 x 1.4 = R19.1 which rounds to R20). The result is moved to the bottom and placed in the THIS MESSAGE space (figure 2) for deflection correction.

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81-mm MORTAR

MET DATA CORRECTION SHEET FOR MORTARS

For use of this form, see FM 23-91; the proponent agency is U. S. Continental Army Command

COMMAND DATA			MET MESSAGE			
CHARGE: 6	CHART RANGE: 2600	ELEVATION: 1144	TYPE: 3	STATION: 625602	DATE: 07	
ALT OF MORTARS (m): 210			TIME: 0806	ALT MDP: 300	LINE NUMBER: 4	
ALT OF MDP: 300			WIND DIRECTION: 2500	WIND VELOCITY: 16	AIR TEMP: 99.6	AIR DENSITY: 95.3
ABOVE + / SECTION MDP Δ H / (BELOW −): + / (−) 90			Δ H CORRECTIONS		ΔT (+) −.2	ΔD (+) −.9
			CORRECTED VALUES		99.8	96.2

WIND COMPONENTS AND DEFLECTION CORRECTION

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	6400
DIRECTION OF WIND	2500
DIRECTION OF FIRE	−1400
CHART DIR OF WIND	1100

CROSS WIND: 16 (VELOCITY) × (L) (R) .88 (COMPONENT) = (L) (R) 14.1 (LATERAL WIND) KNOTS × 1.4 (CORR FACTOR) = R20 (DEFL CORR)

RANGE WIND: 16 (VELOCITY) × (T) (H) .47 (COMPONENT) = (T) (H) 7.5 (RANGE WIND) KNOTS

MET RANGE CORRECTIONS

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARDS	UNIT CORRECTIONS	PLUS	MINUS
POWDER TEMP	ΔV −.9		(D) .9	19.9	18	
RANGE WIND	(I) (H) 7.5		(T) (H) 7.5	5.5	41	
AIR TEMP	99.8	T	(D) .2	.1	—	—
AIR DENSITY	96.2	D	(D) 3.8	−6.9		26
WT OF PROJECTILE	□	□	(D)			
MET CORRECTION TO APPLY				TOTAL	59	26
					26	
				RANGE CORR	33	

	DEFL	RANGE
LAST MESSAGE	(L) (R)	+ / −
THIS MESSAGE	(L) (R) 20	(+) / − 33
CORR TO APPLY	(L) (R)	+ / −

DA FORM 2601-1 [illegible] WHICH IS OBSOLETE

Figure 2. Completed MET Data Correction Sheet for Mortars.

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CHARGE 6

TABLE B

FT-81-AI-3

TEMPERATURE AND DENSITY CORRECTIONS

CTG, HE, M374A2
FUZE, PD, M567

CORRECTIONS TO TEMPERATURE (DT) AND DENSITY (DD), IN PERCENT, TO COMPENSATE FOR THE DIFFERENCE IN ALTITUDE, IN METERS, BETWEEN THE BATTERY AND THE MDP

DH		0	+10-	+20-	+30-	+40-	+50-	+60-	+70-	+80-	+90-
0	DT	-0.0	0.0	0.0	-0.1+	-0.1+	-0.1+	-0.1+	-0.2+	-0.2+	-0.2+
	DD	0.0	-0.1+	-0.2+	-0.3+	-0.4+	-0.5+	-0.6+	-0.7+	-0.8+	-0.9+
+100-	DT	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.3+	-0.3+	-0.4+	-0.4+	-0.4+
	DD	-1.0+	-1.1+	-1.2+	-1.3+	-1.4+	-1.5+	-1.6+	-1.7+	-1.8,	-1.9+
+200-	DT	-0.5+	-0.5+	-0.5+	-0.6+	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+
	DD	-2.0+	-2.1+	-2.2+	-2.3+	-2.4+	-2.5+	-2.6+	-2.7+	-2.8+	-2.9+
+300-	DT	-0.7+	-0.7+	-0.7+	-0.8+	-0.8+	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+
	DD	-3.0+	-3.1+	-3.2+	3.3+	-3 4+	-3.5+	-3.6+	-3.7+	-3.8+	-3.9+

NOTES — 1. DH IS BATTERY HEIGHT ABOVE OR BELOW THE MDP.
2. IF ABOVE THE MDP, USE THE SIGN BEFORE THE NUMBER.
3. IF BELOW THE MDP, USE THE SIGN AFTER THE NUMBER.

Figure 3. Table B, Air Temperature and Density Corrections.

f. Range Correction. All known values should already be written in the proper spaces except V, which is found as follows. The computer enters table C (figure 7) and finds the temperature closest to that recorded for the propellant (it may be either Fahrenheit or centigrade); V appears in the center column on the same line as the temperature. The computer now determines the amount by which these known values vary from the standard values upon which the firing tables are based. The variations from standard must be multiplied by correction factors from table D (figure 6) to convert them to range correction in meters. Enter table D (correction factors) (figure 6) on the line corresponding to the adjusted range and find the correction factor for each variation from standard; enter the factor with its sign on the MET sheet. Multiply the variation from standard by the correction factor and place the result (rounded to the nearest whole meter) in the column with the same sign as the correction factor. When all of the corrections have been muiltiplied, add the two columns and determine the net correction (+33 in the example). Round the result to the nearest 10 meters and write it in the range box for THIS MESSAGE.

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FT 81-AI-3
CTG, HE, M374A2
FUZE, PD, M567

TABLE A
WIND COMPONENTS

CHARGE
6

COMPONENTS OF A ONE KNOT WIND

CHART DIRECTION OF WIND	CROSS WIND	RANGE WIND
MIL	KNOT	KNOT
0	0	H1.00
100	R.10	H.99
200	R.20	H.98
300	R.29	H.96
400	R.38	H.92
500	R.47	H.88
600	R.56	H.83
700	R.63	H.77
800	R.71	H.71
900	R.77	H.63
1000	R.83	H.56
→ 1100	R.88	H.47
1200	R.92	H.38
1300	R.96	H.29
1400	R.98	H.20
1500	R.99	H.10
1600	R1.00	0
1700	R.99	T.10
1800	R.98	T.20
1900	R.96	T.29
2000	R.92	T.38
2100	R.88	T.47
2200	R.83	T.56
2300	R.77	T.63
2400	R.71	T.71
2500	R.63	T.77
2600	R.56	T.83
2700	R.47	T.88
2800	R.38	T.92
2900	R.29	T.96
3000	R.20	T.98
3100	R.10	T.99
3200	0	T1.00

CHART DIRECTION OF WIND	CROSS WIND	RANGE WIND
MIL	KNOT	KNOT
3200	0	T1.00
3300	L.10	T.99
3400	L.20	T.98
3500	L.29	T.96
3600	L.38	T.92
3700	L.47	T.88
3800	L.56	T.83
3900	L.63	T.77
4000	L.71	T.71
4100	L.77	T.63
4200	L.83	T.56
4300	L.88	T.47
4400	L.92	T.38
4500	L.96	T.29
4600	L.98	T.20
4700	L.99	T.10
4800	L1.00	0
4900	L.99	H.10
5000	L.98	H.20
5100	L.96	H.29
5200	L.92	H.38
5300	L.88	H.47
5400	L.83	H.56
5500	L.77	H.63
5600	L.71	H.71
5700	L.63	H.77
5800	L.56	H.83
5900	L.47	H.88
6000	L.38	H.92
6100	L.29	H.96
6200	L.20	H.98
6300	L.10	H.99
6400	0	H1.00

Figure 4. Table A, Wind Components.

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CTG, HE, M374A2
FUZE, PD, M567

TABLE D
BASIC DATA

CHARGE 6

1	2	3	4	5	6	7
RANGE	ELEV	D ELEV PER 100 M DR	APPROX NO. OF TURNS PER 100 M DR	LINE NO.	TIME OF FLIGHT	AZIMUTH CORRECTION CW OF 1 KNOT
M	MIL	MIL	NO.	NO.	SEC	MIL
2200	1235	21	2	4	36.7	1.7
2225	1229	21	2	4	36.7	1.7
2250	1224	21	2	4	36.6	1.7
2275	1219	21	2	4	36.5	1.6
2300	1214	22	2	4	36.4	1.6
2325	1208	22	2	4	36.4	1.6
2350	1203	22	2	4	36.3	1.6
2375	1197	22	2	4	36.2	1.6
2400	1192	22	2	4	36.1	1.6
2425	1186	23	2	4	36.0	1.5
2450	1180	23	2	4	35.9	1.5
2475	1174	23	2	4	35.9	1.5
2500	1169	24	2	4	35.8	1.5
2525	1163	24	2	4	35.7	1.5
2550	1157	24	2	4	35.6	1.5
2575	1151	25	2	4	35.5	1.4
→ 2600	1144	25	2	(4)	35.4	(1.4)
2625	1138	25	3	4	35.3	1.4
2650	1132	26	3	4	35.2	1.4
2675	1125	26	3	4	35.1	1.4
2700	1119	27	3	4	35.0	1.4
2725	1112	27	3	4	34.8	1.3
2750	1105	28	3	4	34.7	1.3
2775	1098	28	3	4	34.6	1.3
2800	1091	29	3	4	34.5	1.3
2825	1084	29	3	4	34.4	1.3
2850	1076	30	3	4	34.2	1.3
2875	1069	31	3	4	34.1	1.2
2900	1061	31	3	4	33.9	1.2
2925	1053	32	3	4	33.8	1.2
2950	1045	33	3	4	33.6	1.2
2975	1037	34	3	4	33.5	1.2
3000	1028	35	4	4	33.3	1.2

Figure 5. Table D, Basic Data.

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FT 81-AI-3 TABLE D CHARGE 6

CTG, HE, M374A2 CORRECTION FACTORS
FUZE, PD, M567

1	8	9	10	11	12	13	14	15
RANGE	RANGE CORRECTIONS FOR							
	MUZZLE VELOCITY 1 M/S		RANGE WIND 1 KNOT		AIR TEMP 1 PCT		AIR DENSITY 1 PCT	
	DEC	INC	HEAD	TAIL	DEC	INC	INC	DEC
M	M	M	M	M	M	M	M	M
2200	16.9	-14.7	5.3	-4.3	0.1	0.0	-5.8	5.7
2225	17.1	-14.9	5.4	-4.3	0.1	0.0	-5.8	5.8
2250	17.2	-15.0	5.4	-4.3	0.1	0.0	-5.9	5.9
2275	17.4	-15.2	5.4	-4.3	0.1	0.0	-6.0	5.9
2300	17.6	-15.4	5.4	-4.3	0.1	0.0	-6.0	6.0
2325	17.8	-15.5	5.4	-4.4	0.1	0.0	-6.1	6.1
2350	18.0	-15.7	5.4	-4.4	0.1	0.0	-6.2	6.1
2375	18.2	-15.9	5.4	-4.4	0.1	0.0	-6.2	6.2
2400	18.4	-16.0	5.5	-4.4	0.1	0.0	-6.3	6.3
2425	18.6	-16.2	5.5	-4.4	0.1	0.0	-6.4	6.3
2450	18.7	-16.4	5.5	-4.5	0.1	0.0	-6.4	6.4
2475	18.9	-16.5	5.5	-4.5	0.1	0.0	-6.5	6.5
2500	19.1	-16.7	5.5	-4.5	0.1	0.0	-6.6	6.6
2525	19.3	-16.8	5.5	-4.5	0.1	0.0	-6.6	6.6
2550	19.5	-17.0	5.5	-4.5	0.1	0.0	-6.7	6.7
2575	19.7	-17.2	5.5	-4.5	0.1	0.0	-6.8	6.8
→ 2600	19.9	-17.3	5.5	-4.6	0.1	0.0	-6.9	6.8
2625	20.1	-17.5	5.5	-4.6	0.1	0.0	-6.9	6.9
2650	20.2	-17.7	5.6	-4.6	0.1	0.0	-7.0	7.0
2675	20.4	-17.8	5.6	-4.6	0.1	0.0	-7.1	7.0
2700	20.6	-18.0	5.6	-4.6	0.1	0.0	-7.1	7.1
2725	20.8	-18.1	5.6	-4.6	0.1	0.0	-7.2	7.2
2750	21.0	-18.3	5.6	-4.7	0.1	0.0	-7.3	7.2
2775	21.2	-18.5	5.6	-4.7	0.1	0.0	-7.3	7.3
2800	21.4	-18.6	5.6	-4.7	0.1	0.0	-7.4	7.3
2825	21.6	-18.8	5.6	-4.7	0.1	0.0	-7.5	7.4
2850	21.8	-19.0	5.6	-4.7	0.1	0.0	-7.5	7.5
2875	22.0	-19.1	5.5	-4.7	0.1	0.0	-7.6	7.5
2900	22.1	-19.3	5.5	-4.8	0.1	0.0	-7.7	7.6
2925	22.3	-19.5	5.5	-4.8	0.1	0.0	-7.7	7.7
2950	22.5	-19.6	5.5	-4.8	0.1	0.0	-7.8	7.7
2975	22.7	-19.8	5.5	-4.8	0.1	0.0	-7.9	7.8
3000	22.9	-19.9	5.5	-4.8	0.1	0.0	-7.9	7.8

Figure 6. Table D, Correction Factors.

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FT 81-AI-3 TABLE C CHARGE 6

CTG, HE, M374A2
FUZE, PD, M567

PROPELLANT TEMPERATURE

VARIATIONS IN MUZZLE VELOCITY
DUE TO PROPELLANT TEMPERATURE

TEMPERATURE OF PROPELLANT	VARIATION IN VELOCITY	TEMPERATURE OF PROPELLANT
DEGREES F	M/S	DEGREES C
-40	-7.6	-40.0
-35	-7.2	-37.2
-30	-6.8	-34.4
-25	-6.4	-31.7
-20	-6.0	-28.9
-15	-5.6	-26.1
-10	-5.2	-23.3
-5	-4.9	-20.6
0	-4.5	-17.8
5	-4.1	-15.0
10	-3.8	-12.2
15	-3.4	-9.4
20	-3.1	-6.7
25	-2.7	-3.9
30	-2.4	-1.1
35	-2.1	1.7
40	-1.8	4.4
45	-1.5	7.2
50	-1.2	10.0
→ 55	-0.9	12.8
60	-0.6	15.6
65	-0.3	18.3
70	0.0	21.1
75	0.3	23.9
80	0.5	26.7
85	0.8	29.4
90	1.1	32.2
95	1.3	35.0
100	1.5	37.8
105	1.8	40.6
110	2.0	43.3
115	2.2	46.1
120	2.4	48.9
125	2.6	51.7
130	2.8	54.4

Figure 7. Table C, Propellent Temperature.

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g. MET Correction. The contribution of meteorological factors at the time the MET was computed in the amount recorded by THIS MESSAGE, here R20, +33. The change in the deflection correction is expressed as the direction and number of mils change from the concurrent MET (R20) to the first subsequent MET (R8). The horizontal scale of figure 8 illustrates a convenient method for determining the difference, in this case LEFT 12. The range change is the difference between the range correction for the concurrent MET (+33) and that for the subsequent MET (+66). The vertical scale of figure 8 shows how to determine the range correction; here, +33. The completed MET CORR TO APPLY section would look like this:

	Deflection	Range
	L	(+)
LAST MESSAGE	20	33
	(R)	-
	L	(+)
THIS MESSAGE	8	66
	(R)	-
	(L)	(+)
CORR TO APPLY	12	33
	R	-

The method of determining the correction to apply (L12, +33) to the data from the registration is recorded on the data sheet (figure 9). If several hours later another MET is received and calculated (call this the second subsequent MET), the corrections to apply would be calculated by finding the changes in deflection and range corrections between the first subsequent MET (which is now in the LAST MESSAGE box) and the second subsequent MET, using exactly the same method as was used before.

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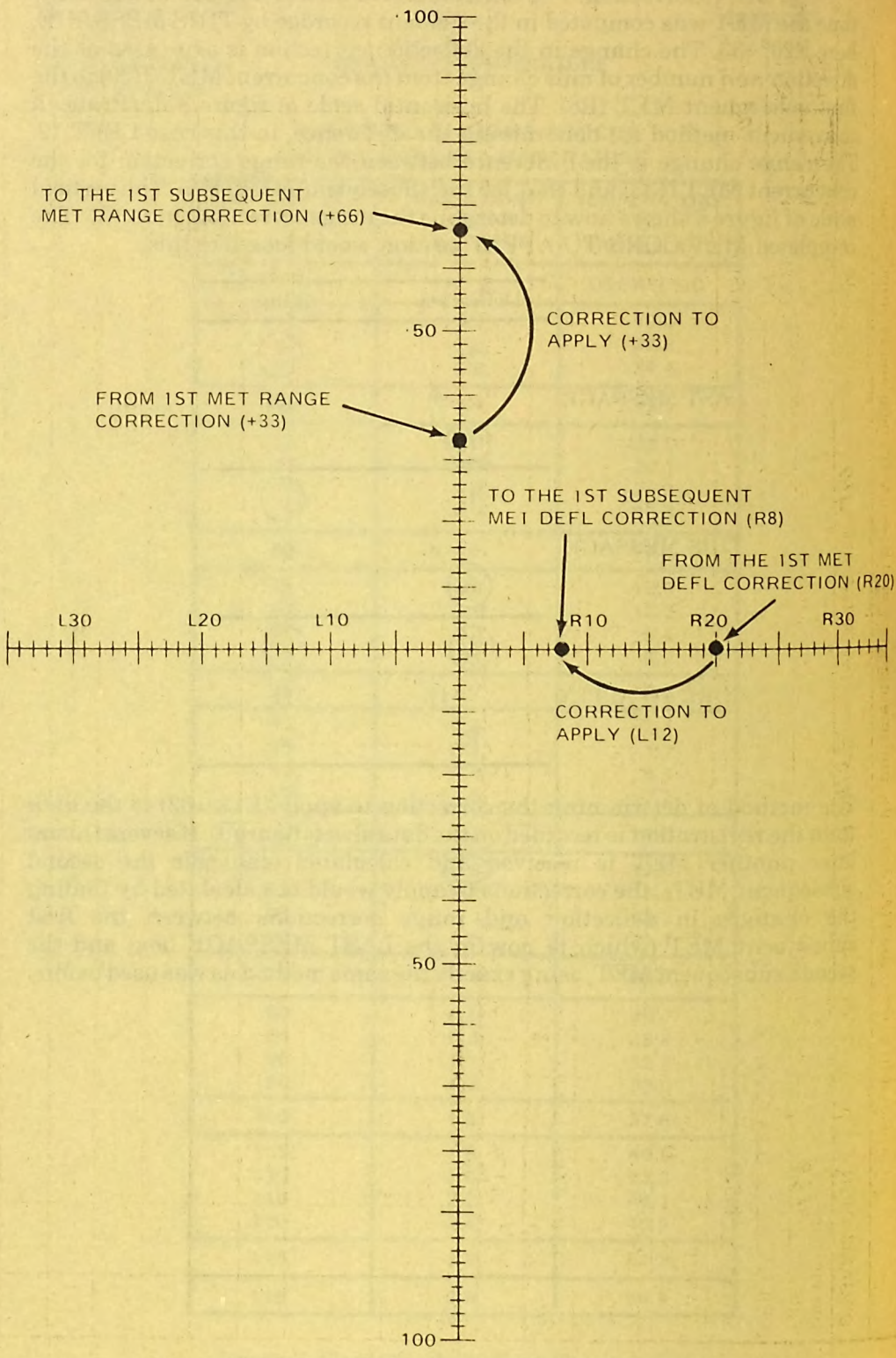

Figure 8. Applying MET to MET.

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DATA SHEET

For use of this form, see FM 23-91; the proponent agency is U S Army Training and Doctrine Command

ORGANIZATION | MORTAR GRID 13109154 | MORTAR ALT 210 | DATE

DIR OF FIRE 1468 | OP GRID 1 | OP ALT 1 | RCF ~~+42~~ +55

DRIFT | 2 | 2 | DEFL CORR ~~R23~~ R11

MT AZ 1450 | 3 | 3 | GRID INT 14/93

TARGET IDENT		CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE			
TGT NO	GRID	DEFL	RG / CHG	DEFL CORR	RG CORR	ALT / VI	ALT CORR	DEFL	RG / CHG	FUSE TIME SET	ELEV	TIME FIRED	TARGET DESCR	METH OF ENGMT	SURVEIL-LANCE
RP1	1550 9/85	2782	2425	R 23	+100	360 +150	+75	2759	2600 / 6		1144		RP1 R.J.	#2 1RCI	R/C S/A
	1ST/MET		R20 +33				2ND/MET		R8 +	66	=	L12	+33		
RP1		2782	2425	R11	+133	360 +150	+75	2771	2625 / 6		1138		2.4 +55.4 +133 = NEW RCF +55 NEW DEF Corr R11		

Figure 9. Data Sheet.

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5. **Deflection Correction:** The deflection correction recorded on the data sheet from the registration was R23. The correction determined from the MET messages was L12. To determine the new deflection correction, algebraically add the two figure as follows:

Deflection correction	R(-)23
MET correction	L(+)12
New deflection correction	R(-)11

6. **Range Correction Factor (RCF):** To determine the new RCF, use the correction taken from the data sheet and the MET correction, and algebraically add these two figures as follows:

RP range correction	+100
MET range correction	+ 33
New range correction	+133

From the new range correction, the new RCF is determined as follows:

$$\frac{\text{Range Correction}}{\text{Chart Range (in thousands)}}$$

$$2.4\overset{\wedge}{)}\overline{133.0\overset{\wedge}{0}} \qquad 55.4 = +55 \text{ RCF}$$

55.4
120
130
120
100
96
4

These new corrections are now recorded on the data sheet and used to fire new targets.

NOTE: When dividing by a decimal number, the placement of the decimal point in the answer is all-important. To be sure it is placed correctly, remember that before dividing by a decimal number divisor (such as 2.4), the decimal point must first be moved to the right of that entire number, to make the divisor a whole number (in this case, past the digit 4; thus, 2.4 becomes "24. ". (The caret (∧) merely indicates that a decimal point has been moved.) Remember, as a second step, that the decimal in the dividend (such as 133.) must also be moved to the right the same number of spaces as it was moved in the divisor. Thus, in this example, 133. as a dividend becomes "133.0∧"; the added zero represents the space the decimal was moved in the divisor. As the third and final step, always place the decimal point in the answer directly above the caret (∧) in the dividend.

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7. **Updating Firing Data:** After the new firing corrections have been determined and as time permits, it is possible to update firing data for all plotted and previously fired targets. The procedures for updating target information is exactly the same as with re-registration corrections.

REFERENCE:

FM 81-A1-3, Firing Table, 81-mm Mortar, Jan 73 (page XVI, para 6)

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TASK NUMBER: 071-322-1608

PREPARE A FIRING CHART FOR OPERATION AND DETERMINE INITIAL FIRING DATA

CONDITIONS:

As the fire direction computer of a 107-mm (4.2-in) mortar, given a firing chart, FDC kit, tabular firing tables, 1:50,000 map, and coordinates of the mortar position and target or registration point.

STANDARDS:

Prepare a firing chart for operation within 15 minutes and:

1. Establish a coordinate system.

2. Determine the mounting azimuth to within 5 mils.

3. Place out direction and deflection indices.

4. Plot all known locations of mortar, targets, and registration points to within 10 meters.

PERFORMANCE MEASURES:

1. **Construction of Azimuth Indices for the Graphical Firing Fan (GFF).**

a. Azimuths describe the direction from one point to another point; for the azimuth to have meaning, the specific point from which it is measured usually must be known. On the firing chart, each point from which azimuths will be measured (plotted) must be plotted, and each point must have its own azimuth indices.

b. An azimuth index is a line constructed on the firing chart opposite which the numbering of the azimuth scale on the GFF can be read. The mil arc is numbered at 100-mil intervals from 0 through 9 (we actually read through 999), which means that indices should be constructed at 1,000-mil intervals, and numbered in thousands of mils. The thousands digit of an azimuth will be read from the index; the hundreds digit, from the numbering on the mil arc; and the tens and units digits, by interpolation.

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c. Azimuth indices are constructed so that when the left edge of the range arm is alined on an azimuth which is an integral multiple of 1,000, the appropriately numbered index is opposite the 0 (rightmost) graduation of the arc. The procedure for construcing azimuth indices follows:

(1) Plot a location directly north or south (i.e., with the same easting coordinate), or east or west (i.e., with the same northing coordinate), of the vertex point at a range of about 3,000 meters, and place a pin in it.

(2) Place a vertex pin in the vertex point, and engage it with the vertex of the GFF. Orient the GFF so that the left edge of the range arm is tight against the plotting pin. Find the second digit of the azimuth along which the range arm is pointing (e.g., 4 of 6400). Locate the digit on the numbering of the azimuth scale of the mil arc, and place a plotting pin in the firing chart beside the corresponding long graduation (figure 1).

(3) Rotate the GFF so that the left edge of the range arm is over the index pinhole (the pin has been removed). Using the pencil, draw a fine line from the pinhole to 1 to 1½ inches from the mil arc. The index is labeled with the appropriate identification (M for mortar, 42 for the OP, with callsign U742).

(4) Place out enough azimuth indices so that any azimuth within a mortar's (OP's) sector of responsibility can be determined. To construct an azimuth index 1,000 mils right (left) of a previously established index, measure 1,000 mils right (left) of the old index mark, place a pin beside the mil arc, and draw the index as in (3), above.

2. **Measuring and Plotting Azimuths and Angles with the GFF.**

a. Once the appropriate azimuth indices have been drawn, measurement of azimuths is quick and simple. Place a pin in the locatin to which an azimuth is desired, and rotate the range arm until its left edge is against the pin. Read the first digit of the azimuth from the information printed beside the index mark touching the scale. Read the second digit of the azimuth from the numbering superimposed on the azimuth scale of the mil arc. Read the third and fourth digits from the finer (unnumbered) graduations on the mil scale.

b. To plot an azimuth, rotate the GFF until the appropriate index mark touches the mil scale beside the desired azimuth.

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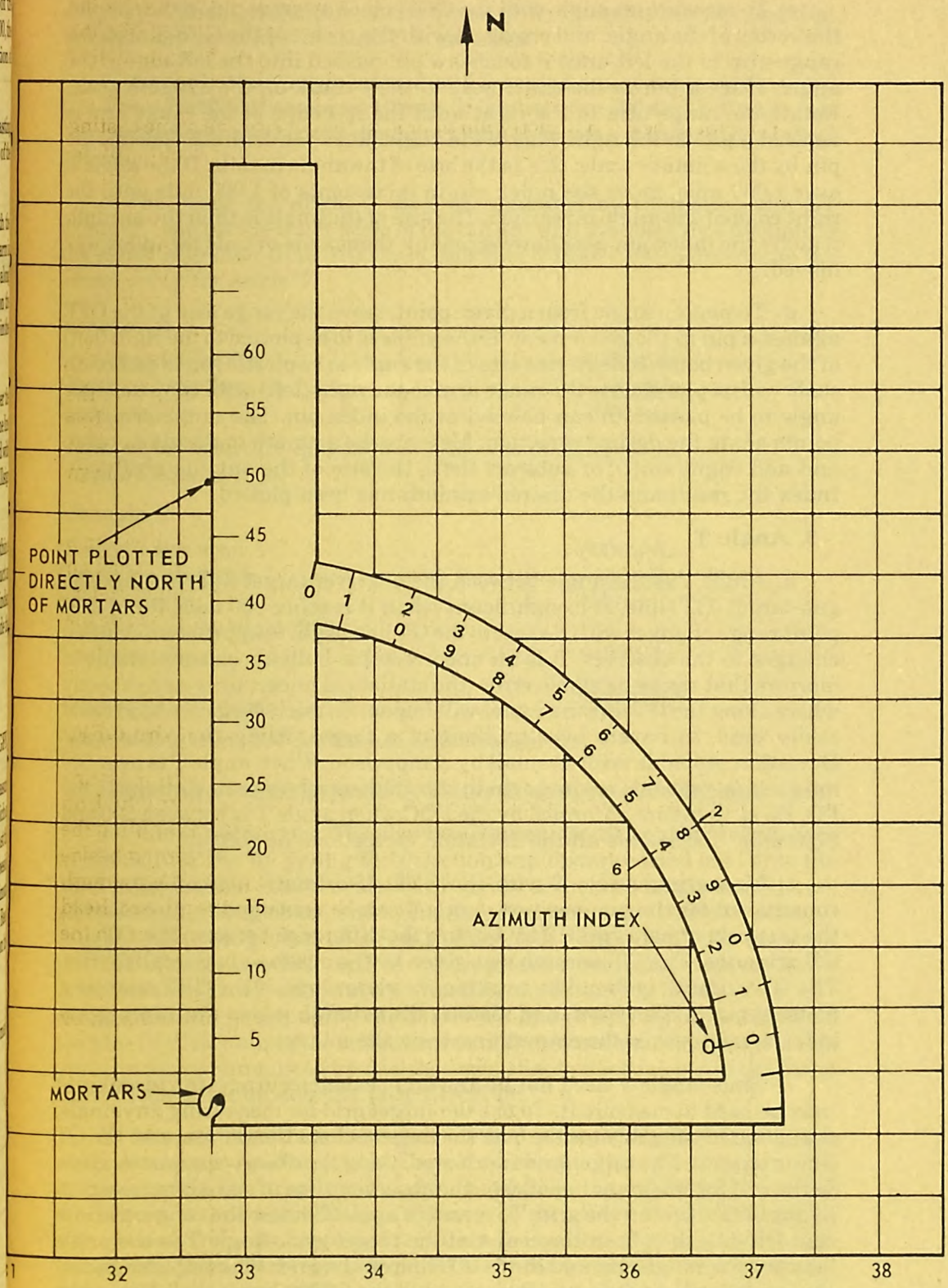

Figure 1. Graphical firing fan.

2-V-B-1.3

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c. To measure an angle with the GFF, place a vertex pin in the chart at the vertex of the angle, and engage it with the vertex of the GFF. Rotate the range arm to the left until it touches a pin pushed into the left edge of the angle. Place a pin in the chart next to the 0 mark on the azimuth scale. Rotate the range arm to the right until the left edge of the range arm is against a pin on the right edge of the angle. Read the azimuth opposite the pin by the azimuth scale; this is the size of the angle in mils. If the angle is over 1,000 mils, move the index pin in increments of 1,000 mils until the right edge of the angle is reached. The size of the angle is then the azimuth read by the index pin plus however many thousands of mils the index was moved.

d. To plot an angle from a given point, move the range arm of the GFF against a pin in the given point. If the angle is to be plotted to the right (left) of the given point, index 0 (the size of the angle to be plotted) on the azimuth scale with a pin. Rotate the range arm to the right (left) until the size of the angle to be plotted (0) can be read at the index pin. The range arm then points along the desired direction. Measure the azimuth to the given point, and add (right shift), or subtract (left), the size of the angular shift to it. Index the result and the desired azimuth has been plotted.

3. **Angle T.**

a. Angle T is the angle between the observer-target (OT) line and the gun-target (GT) line. It is significant when it reaches 500 mils, for at that point range changes with respect to the GT line begin to appear as deviation changes to the observer. It is an uncorrectable ballistic charactertistic of mortars that range probable error (the statistical uncertainty as to exactly where along the GT line the round will impact) is fairly large; a round could easily land 25 meters over or short of a target, firing the same data. Deviation probable error is small by comparison. When angle T is over 500 mils, range probable errors begin to shown themselves as deviations to the FO. He is, therefore, informed by the FDC when angle T is between 500 and 2700 mils, and halves all the deviation corrections he calls in.

b. Measuring Angle T with the GFF. If azimuth indices have been constructed for the gun position, angle T can be measured as discussed in the last part of paragraph 2 by finding the difference between the OT and GT azimuths. The OT azimuth was given by the observer in the call for fire. The GT azimuth is found by rotating the range arm of the GFF against a plotting pin in the target, and reading the azimuth where the appropriate index mark touches the azimuth scale on the mil arc.

c. Since angle T need not be known to exact accuracy, the target grid may be used to measure it. To use the target grid for measuring any angle, the center of the grid must be over the target (where the OT line and the GT line intersect). The target grid is oriented along the observer azimuth given in the call for fire in the usual way; the observer's line of sight is represented by the 0-3200 line on the grid. To measure angle T, rotate the range arm into contact with the pin in the center of the target grid. Angle T is the angle between the range arm and the 0-3200 line on the grid; the computer should count graduations from whichever end of the 0-3200 line is visible over the

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range arm. Each graduation on the target grid represents 10 mils, and that is the accuracy to which angle T is recorded.

d. Angle T is always measured and recorded on the computer's record (DA Form 2399) to the nearest 10 mils. If it is between 500 and 2700 mils, it is transmitted to the FO in the message to the observer rounded to the nearest 100 mils.

e. The value for angle T may be computed by comparing the GT azimuth, read off the inner scale of the mil arc, and the observer direction. If the result is greater than 3200 mils, subtract it from 6400 to determine the actual value for angle T.

Example A

Gun-target azimuth ..... 6000 mils
Observer direction ..... 4100 mils
Result equals ..... 1900 mils

Value is between 500 and 2700 and is sent to observer as "angle T equals 1900."

Example B

Observer direction ..... 6000 mils
Gun-target azimuth ..... 050 mils
Result equals ..... 5950 mils
Value is greater than 3200, so
subtract from ..... 6400 mils
-5950 mils
Actual angle T equals ..... 450 mils

Value is less than 500 and is not sent to observer.

4. **Plotting a Point Located by Polar Coordinates or Intersection.**

a. Polar Coordinates. The observer locates a point by polar coordinates in his call for fire by giving the direction and distance from his OP to the point. His position must be known to survey accuracy (8-digit coordinate), plotted on the firing chart, and azimuth indices constructed. The vertex pin is pushed into the plotted observer position and engaged with the vertex of the GFF. Rotate the GFF until the appropriately numbered azimuth index touches the mil scale opposite the direction announced by the observer. The range arm then points along the observer's line of sight to the point. Slide the plastic cursor along the range arm until the manufacturer's gauge line is over the range announced by one observer. Place a plotting pin in the firing chart. This pin indicates the target location.

b. Intersection. The intersection method of target location requires two observers in surveyed locations. Each of them announces the direction from his position to the target point, and one of them may also give a vertical shift; however, no estimation of distance is necessary. A point located by intersection from two surveyed locations is considered surveyed if a shift not greater than 50 meters is required to list the target. On the firing chart, both OP locations must be plotted, and azimuth indices must be constructed. First, move the vertex pin to one of the OPs and position the

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GFF (RDP) so that the range arm points along the corresponding observer's direction to the target. Using the 6H pencil, draw a fine light line along the range arm. Repeat the process for the other OP. Where the two light lines cross, place a plotting pin; this is the location of the target. The FO who called the fire mission to the FDC will normally control the fire mission.

5. **Target Grid.**

a. General. The target grid is a convenient device for plotting shifts and corrections called in by the observer with respect to his line of sight. This procedure enables the observer to make all of his corrections with respect to the line connecting his position and the target (the OT line). In the FDC, on the other hand, all data is computed with respect to the GT line. A target grid is therefore used with each chart in the FDC to expedite plotting. An arrow extends across the target grid indicating the direction in which the observer is looking. Around the outside of the grid is an azimuth scale, graduated every 10 mils and numbered every 100. It is numbered counterclockwise because the scale is read opposite a stationary index on the chart.

b. Positioning the Target Grid. Whenever a target grid is first positioned and oriented, a pin must be placed in the center of the grid as a pivot. (Since this center point is used very frequently, it wears quickly unless reinforced, as with a small piece of masking tape on the bottom side of the grid.) With a pin through the center, the target grid may be placed anywhere and oriented as in c below; however, it will almost always be placed on a target previously plotted. When properly oriented, it can be used to shift from some known point to a new target.

c. Orienting the Target Grid. Once the target grid has been placed on the chart at some convenient location with a pin through the center to act as a pivot, an index must be drawn for proper orientation. Draw this index directly north of the center of the grid in the following way.

(1) Rotate the target grid until the arrow points generally north.

(2) Make fine adjustments until the lines on the grid are exactly parallel to the grid lines on the firing chart.

(3) Mark the location of 0 on the azimuth scale with a pinprick on the chart. Lift the target grid slightly and draw a fine line running in a north-south direction from slightly below the pinprick to about 1 inch above it. This index line is labeled with an "N" so it will not be confused with other indices.

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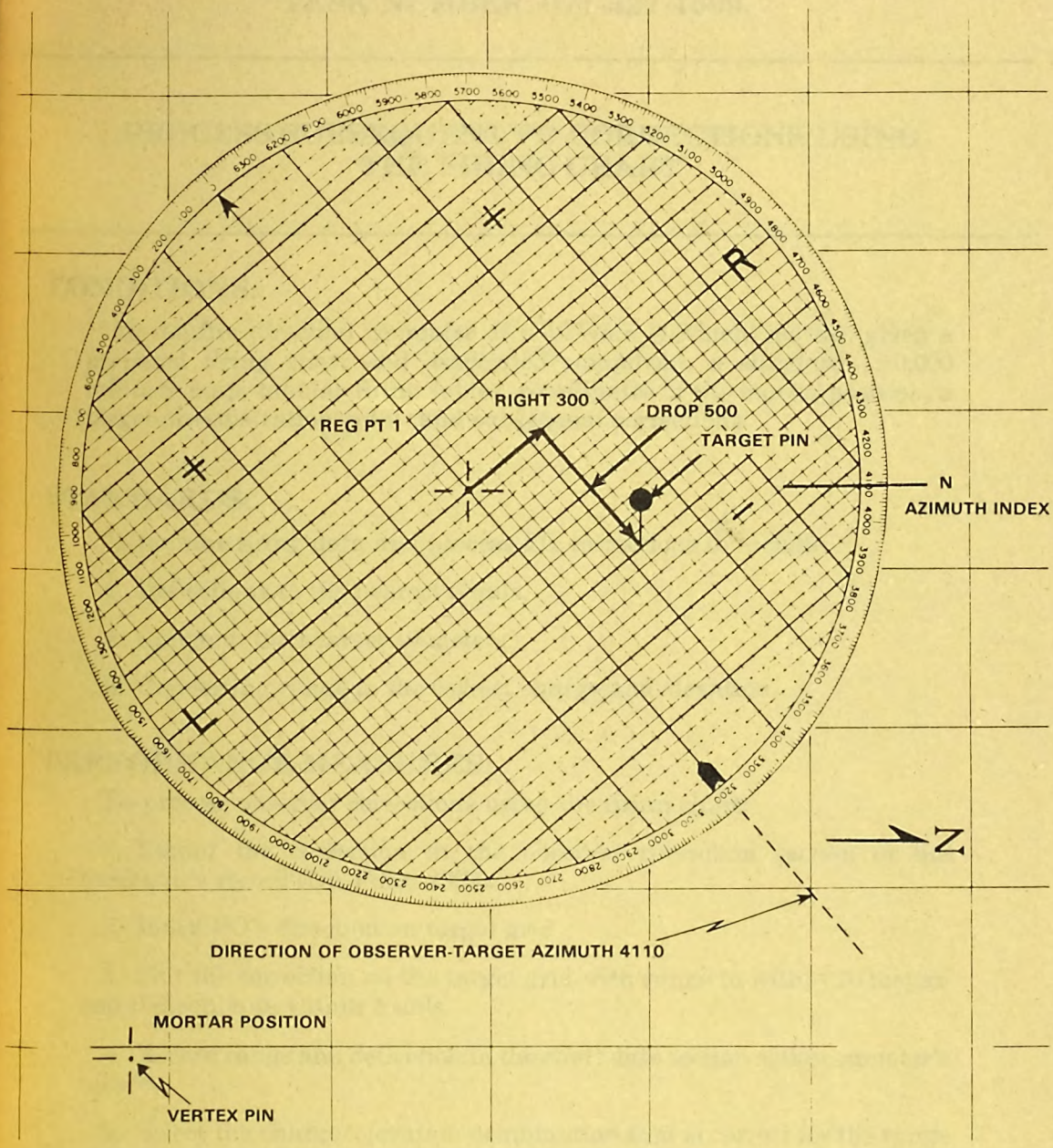

Figure 2.

(4) Rotate the target grid until the OT direction given in the call for fire is opposite the index mark. The OT direction is ALWAYS rounded to the nearest 10 mils. Shifts can now be made using the small squares of the target grid (figure 2).

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 11, page 11-15, para 11-8)

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TASK NUMBER: 071-322-1609

PROCESS SUBSEQUENT FO CORRECTIONS USING THE FIRING CHART

CONDITIONS:

As the fire direction computer of a 107-mm (4.2-inch) mortar, given a prepared firing chart and associated equipment, a standard 1:50,000 military map, tabular firing tables, coordinates of the mortar position, a target or registration point, and subsequent corrections.

STANDARDS:

Determine firing data and process FO corrections to include:

1. Deflections to the nearest 5 mils.
2. Range to the nearest 10 meters.
3. Converting range to the correct charge and elevation.

PERFORMANCE MEASURES:

To process observer corrections using the firing chart:

1. Record the correction in the observer correction section of the computer's record (DA Form 2399).
2. Index FO's direction on target grid.
3. Plot the correction on the target grid with range to within 10 meters and deflection to within 5 mils.
4. Record range and deflection in the chart data section of the computer's record.
5. Select the charge/elevation combination that is correct for the range recorded in the chart data section of the computer's record.
6. Apply range/deflection correction as necessary.
7. Repeat steps 1-6 until target (registration point) is engaged.
8. Mark and label target.

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 11, page 11-21, para 11-12)

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TASK NUMBER: 071-322-1610

DETERMINE DATA FOR SHEAF ADJUSTMENT

CONDITIONS:

Given a section with the base mortar (No. 2) registered, FDC equipment, and a request for a sheaf adjustment (angle T will be less than 500 mils).

STANDARDS:

Determine firing data for sheaf adjustment to include:

1. Deflections to the nearest 5 mils.

2. Range to the nearest 10 meters.

3. Converting determined range to the correct charge and elevation.

PERFORMANCE MEASURES:

1. In some cases, individual weapon corrections for deflection, fuze setting, charge, and elevation are computed and applied to get a specific pattern of bursts. These corrections are called special corrections.

2. The term **sheaf** denotes the lateral distribution of the bursts of two or more weapons fired together. The width of the sheaf is the lateral distance (perpendicular to the direction of fire) between the centers of the flank bursts. The front covered by any sheaf is the width of the sheaf plus the effective width of one burst. A sheaf may be in any one of the following forms (figure 1):

a. Parallel Sheaf (normal). A parallel sheaf is one in which the trajectories of all weapons are parallel.

b. Converged Sheaf. A converged sheaf is one in which the trajectories intersect at the target.

c. Open Sheaf. An open sheaf is one in which the lateral distance between the center of any two adjacent bursts is equal to the maximum effective width of one and one half bursts (60 meters).

3. After registration by the base mortar, the computer directs the observer to adjust the sheaf. Although the mortars are laid parallel with a compass or aiming circle, the sheaf produced on the ground in the target area may not be parallel. This may be caused by the differences in the settling of the baseplates of the mortars, or improper boresighting.

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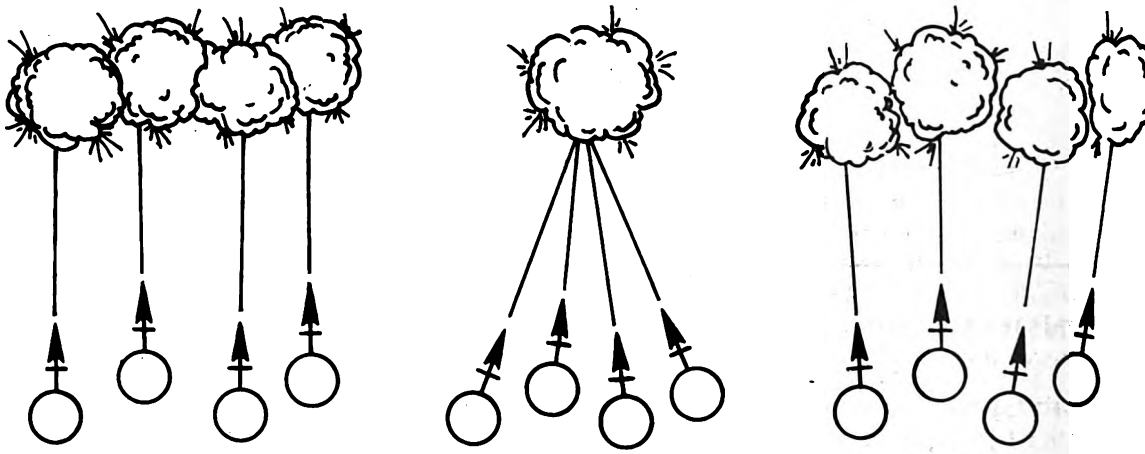

a. PARALLEL SHEAF b. CONVERGED SHEAF c. OPEN SHEAF

Figure 1.

a. There are two methods to adjust a parallel sheaf. The method used depends on the location of the observer with respect to the gun-target (GT) line (whether angle T is greater or less than 500 mils). The angle T is the difference between the azimuth of the GT line and the azimuth of the observer-target (OT) line.

b. Whenever possible, the computer selects an observer located near the GT line so that the angle T will be less than 500 mils.

4. Parallel Sheaf (angle T less than 500 mils).

a. The computer issues a fire command to No.1 and 3 and 4 mortars to fire a section right (of left) with the same adjusted deflection and elevation obtained by the No. 2 mortar. The observer sends back individual deviation corrections in meters for any burst that needs correcting to place it in the proper position in the sheaf. For the 107-mm (4.2-in) mortar, use the 100/R scale. Using these corrections, the mortars are relaid on the aiming posts. Another section right (or left) may be fired to recheck the sheaf if necessary.

NOTE: Any correction of 50 meters or more is refired. When a parallel sheaf is attained, the computer notifies the gunners to refer all mortar sights to a common deflection and to realine aiming posts. This common deflection is the deflection for the base (No. 2) mortar to hit the registration point. The computer disregards range errors when adjusting the sheaf. The range determined for the base (No. 2) mortar is used by all mortars in the section.

b. For example, given a deflection of 2850 and a range of 1,200 meters, the observer's corrections are:

NUMBER ONE, LEFT THREE ZERO
END OF MISSION
SHEAF ADJUSTED

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(1) Mortar No. 3 and 4. Since no correction was reported by the observer for the No. 3 or 4 mortar, their position in the sheaf is correct. The computer determines the correct deflection for mortar No. 1 as in (2), below.

(2) Mortar No. 1. The observer's correction of LEFT THREE ZERO (in meters) is equal to 25 mils at a range of 1,200 (using the 100/R factor or the mil-relation formula); the left 25 mils is added (LARS) to the deflection setting of 2850 because the observer's correction was left and becomes 2875 mils. The computer issues the command NUMBER ONE, DO NOT FIRE, DEFLECTION TWO EIGHT SEVEN FIVE. The gunner of mortar No. 1 indexes the new deflection on the sight and traverses back onto the aiming posts. When the mortar is laid, the computer issues the following command:

SECTION
DEFLECTION TWO EIGHT FIVE ZERO
REFER
REALINE AIMING POSTS

(3) The gunner of mortar No. 1 refers his sight to a deflection of 2850 mils and directs the No. 3 man in his squad to realine the aiming posts without moving the mortar. All mortars are then laid parallel with a common deflection of 2850 mils. Therefore, to fire a parallel sheaf on any target, each mortar of the section is given the same deflection, the one determined for the base mortar.

5. Parallel Sheaf (angle T over 500 mils). When it is not possible for the FDC to use an FO who has an angle T of less than 500 mils to adjust the sheaf, the computer and the FO must coordinate adjusting a converged sheaf as follows:

a. The computer will determine the data for each mortar to fire a converged sheaf as outlined in para 6, below.

b. If the sheaf had been parallel prior to firing the converged sheaf, No. 1, 3 and 4 mortars will hit the same point No. 2 mortar adjusted on. If any of the mortars fail to hit this point, the FO will adjust each mortar onto that point.

c. When all mortars are hitting the same point, the FO will tell the FDC to "CEASE FIRE, SHEAF CONVERGED." This completes the FO's part of the sheaf adjustment.

d. Using the 100/R factor, the computer determines the data to open the converged sheaf to a parallel sheaf, transmits the new data to the No. 1, 3, and 4 mortars, and directs the section to refer and realine aiming posts at the No.2 mortar deflection.

6. Converged Sheaf.

a. The adjustment is normally conducted with the base mortar. A new element is added to the FDC order; CONVERGE ON (the adjusting mortar) is written under SHEAF CORR. Even though each mortar will fire a different deflection in effect, the entire section should be designated to follow the adjusting mortar during the adjustment.

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b. When the observer calls for converge, the following mortars will have only a small deflection change to make, thus speeding the completion of the mission. The observer adjusts onto the target with the same precision as in the one mortar situation.

c. When converge is called for, the entire section must fire on the spot to which the base mortar has been adjusted.

d. The most accurate method of doing this would be to plot each mortar individually, construct a deflection index for each mortar, and read four different deflections to the final adjusting point. This procedure is so complex and time-consuming that it is rarely used. Instead, the 100/R factor is used to move the strike of rounds fired from the other mortars to the same spot as those fired from the adjusting mortar, as illustrated in figure 2.

e. A separate line of the computer's record is used to record each mortar's deflection, the deflection itself being preceded by the number of the mortar to which it applies.

f. For the situation depicted in figure 2, the firing (command) deflections would look like this:

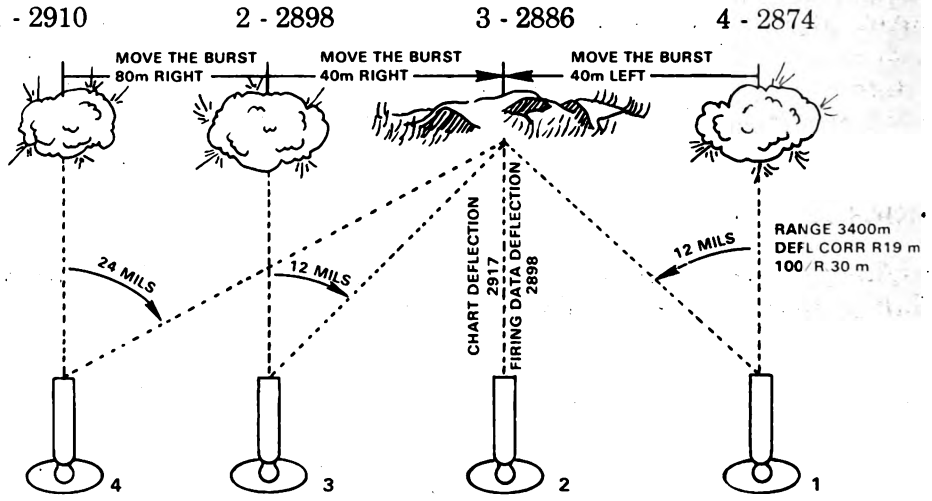

Figure 2.

7. To open sheaf, the FDC reverses the procedure outlined in paragraph 6 above.

8. General. The **firing chart** may be used to convert the observer's corrections from meters to mils for mortars out of sheaf. This technique eliminates the need for the computer to convert the observer's correction to mils using the mil-relation formula or deflection conversion table and then applying the LARS rule to determine the deflection.

a. Procedure. The FO's correction in meters for the mortar out of sheaf is plotted as a shift from the registration point with the disk oriented on the OT azimuth. The range arm is then rotated over the plot, and the deflection is read at the centerline for the mortar(s) out of sheaf. After the deflection

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has been determined, the plot is removed from the firing chart. The computer determines the deflection which would move the No. 2 mortar the distance specified by the observer in his correction. Since all mortars were fired with a common deflection, a deflection which would move the No. 2 mortar a specified distance would also move the No. 1-3 and/or No. 4 mortar the same distance.

b. Sample Problem. The section mounted on an azimuth of 2000 mils completed registration with a range of 2,450 meters and deflection 2749 mils. The section fires for sheaf adjustment and the observer reports, NUMBER THREE, RIGHT THREE ZERO. The observer's azimuth is 2150 mils. To plot the correction, rotate the disk to the observer's azimuth and make a plot 30 meters to the right of the registration point. Rotate the range arm over the plot and determine the deflection (2737). This is the deflection which would move the No. 2 mortar 30 meters to the right. Since No. 3 and 4 mortars have the same deflection as No. 2 mortar on the sight, these will also move the No. 3 and 4 mortar 30 meters to the right.

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 12, page 12-27, para 12-22; page 12-30, para 12-25 and 12-26)

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TASK NUMBER: 071-322-1611

DETERMINE DATA FROM RE-REGISTRATION AND APPLICATION OF CORRECTIONS TO FDC EQUIPMENT

CONDITIONS:

Given FDC equipment, firing data sheet, a registration point, and a directive to re-register and to determine the corrections to apply.

STANDARDS:

Determine firing data from re-registration and apply corrections to include:

1. Determining deflections to the nearest 1 mil with a 5-mil tolerance.
2. Determining range to the nearest 10 meters with a 10-meter tolerance.
3. Applying corrections to FDC equipment.

PERFORMANCE MEASURES:

1. Corrections determined from the initial registration will generally be valid for only a few hours. Changing weather, further settling of the baseplates, changes in ammunition temperature, and other factors tend to invalidate them. Therefore, every 3 to 5 hours, firing corrections should be verified and updated if necessary. One way of doing this is the re-registration, in which the same registration point(s) is refired to determine how much firing corrections have changed.

2. The observer's corrections are plotted on the firing chart, and data is computed and sent to the section. When the observer splits a 50-meter range bracket, he announces END OF MISSION, RE-REGISTRATION COMPLETE with his correction. The computer measures chart data and computes the final firing data, but it is not sent to the section. END OF MISSION is sent to the section. The chief computer may adjust the sheaf again if he has reason to suspect it, but generally this is not done.

3. On completing a re-registration, take three steps to update the fire direction equipment.

a. Place the plotting pin back into the RP (plotted surveyed location) and move GFF against the pin.

b. Erase the adjusted charge gageline placed on the sliding cursor after the registration (figure 1). Construct a new adjusted charge gageline at the charge that hit the RP during the re-registration (figure 2). To do this, strip out the altitude correction (+38) from the adjusted charge.

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NOTE: To strip out altitude correction, reverse the sign of the correction.

Example: Adjusted charge 22
Altitude correction (+)-3/8
New adjusted charge 21 5/8

c. Renumber the drift blocks, erase the old deflection correction placed on the GFF after the registration (figure 1). To place the new deflection correction on the GFF, the drift mark nearest the charge through which the adjusted charge gageline is drawn will be renumbered with the deflection correction at the RP (figure 2).

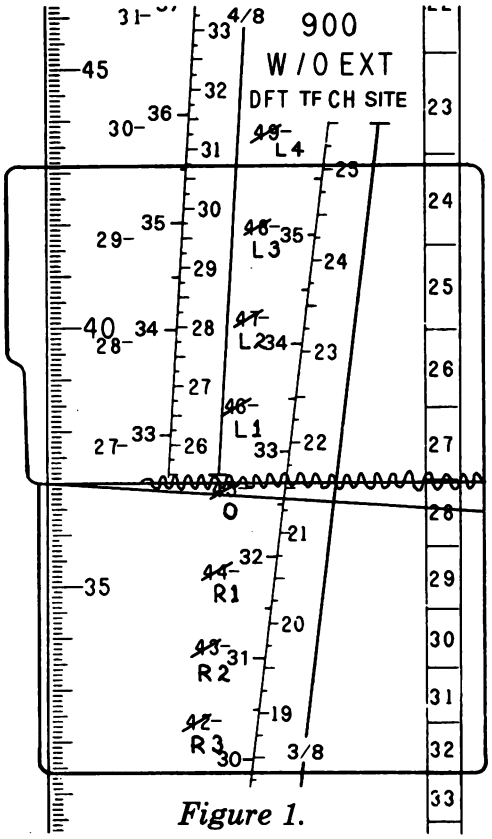

Figure 1.

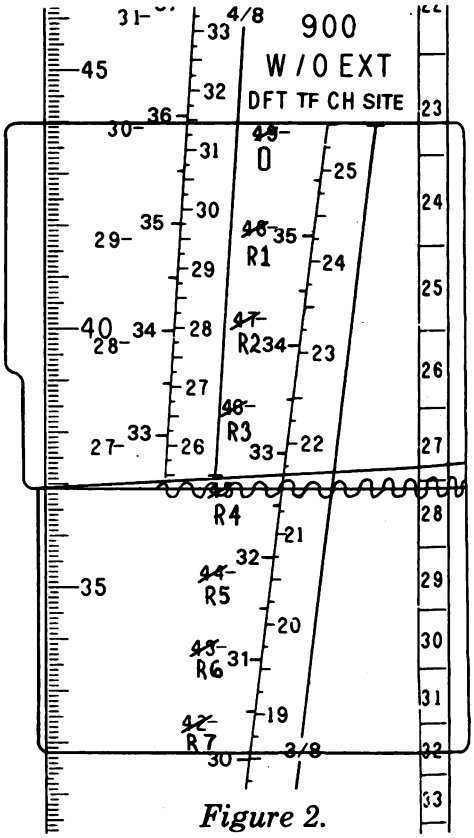

Figure 2.

Example:

The chart deflection to the RP was 2834; after re-registration, the adjusted deflection to hit the RP is 2830. The difference is the deflection correction. In this case, the deflection correction is 4 mils. To determine if the correction is RIGHT (R) or LEFT (L): if the adjusted deflection is LESS than the CHART deflection, it is a RIGHT (R); if the adjusted deflection is GREATER than the CHART deflection, it is a LEFT (L). In this example, the deflection correction is a Right 4.

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 13, page 13-14, para 13-11 thru 13-14)

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TASK NUMBER 071-322-1612

RECORD INFORMATION ON FIRING DATA SHEET (107-MM (4.2-IN))

CONDITIONS:

As the fire direction computer for a 107-mm (4.2-in) mortar platoon, given a pencil, DA Form 2188-R (blank), a standard 1:50,000 military map, location of OP and mortar section, and completed computer record(s) (DA Form 2399).

STANDARDS:

Complete all information on the data sheet (DA Form 2188-R) obtained from the computer's record, or data determined prior to the mission, without error.

PERFORMANCE MEASURES:

1. The data sheets are used to record and maintain up-to-date information and firing data for targets. These may be targets previously fired and of sufficient significance to maintain data on, or preplanned targets upon which fires are scheduled or data maintained on call. When firing corrections become available, all targets are updated to reflect the current firing conditions. DA Form 2188-R will be locally reproduced on 10½ x 8 inch paper (figure 1).

a. ORGANIZATION. Identification of the unit firing.

b. MORTAR GRID. Survey coordinates of section center.

c. MORTAR ALT. Record altitude of section if known.

d. DATE. The date on which the data on the sheet is current.

e. The direction of fire as determined is recorded on the DIR OF FIRE line. Drift is recorded on the DRIFT line. After computing mounting azimuth (direction of fire minus the drift), record it on the MT AZ line.

f. OP GRID/OP ALT. If the location of any of the OPs is known by grid coordinates, record it and its altitude.

g. RCF. Range correction factors are normally not used with the 107-mm mortar.

h. DEFL CORR. When using the M16 plotting board for computing, deflection correction will be recorded here.

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DATA SHEET

For use of this form, see FM 23-91; the proponent agency is U.S. Army Training and Doctrine Command.

ORGANIZATION 1166 MORTAR GRID 02658625 MORTAR ALT 150 DATE 20 JUNE 77

DIR OF FIRE 0350 O.P. GRID 1. 03458720 O.P. ALT 1. 350 RCF

DRIFT 31 2. 05898763 2. 175 DEFL CORR

MT AZ 0319 3. 3. GRID INT 0288

TARGET IDENT		CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE			
TGT NO	GRID	DEFL	RG / CHG	DEFL CORR	RG CORR	ALT / VI	ALT CORR	DEFL	RG / CHG	FUZE TIME SETT	ELEV	TIME FIRED	TARGET DESCR	METH OF ENGMT	SURVEIL-LANCE
RP1	0331 8809	2800	11 7/8	R11	0	210 / +60	+2/8	2789	12 1/8	—	0900	1300	RP1	Sec ① S/L	Req COMP
AB001	0303 8865	2988	14 7/8	R8	0	210 / +60	+2/8	2980	15 1/8	—	0900	1420	PLT IN OPEN	Sec ③ 100m ZONE	EST ID CAS
AB002	0364 8895	2792	17 5/8	R3	0	300 / +150	+4/8	2789	18 1/8	—	0900	1440	WOODEN BLDG	#4 ⑩ HE O	BLDG DEST EST 5 CAS

Figure 1. Sample ballistic MET message.

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i. GRID INT. When using the M16 plotting board for computing, the grid intersection used to set up coordinate system is recorded here.

j. TARGET INDENT. The target number and 8-digit coordinate locating it on the chart or plotting board are written here.

k. CHART DATA. Here, record the chart deflection and charge.

l. FIRING CORRECTIONS. Here, record the deflection correction, the altitude of the target, the vertical interval, and the altitude correction. Normally, range corrections are not determined for each target. Because the adjusted charge gage line is used, this block is left blank or zeros can be used.

m. FIRING DATA. This section contains the most current firing data, in a form suitable for transmission to the section - namely, deflection, charge, fuze time setting, and the elevation.

n. INTELLIGENCE. Record information here which may be of value for future reference by the FDC or the S2. The TIME FIRED block is used for the time the call for fire was received. Target description, method of engagement, and surveillance are self-explanatory (figure 1).

REFERENCE:

None

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TASK NUMBER: 071-322-1613

RECORD METEOROLOGICAL (MET) DATA USING MET DATA SHEET (107-mm MORTAR)

CONDITIONS:

Given DA Form 3675 and a MET message.

STANDARDS:

Within 15 minutes, record MET message on DA Form 3675 without error.

PERFORMANCE MEASURES:

1. The Ballistic MET Message.

a. To place fire on a target without adjustment, a mortar unit must know the exact location of the target, and be able to compensate for all nonstandard conditions. The re-registration is the most accurate method for determining and maintaining current firing corrections, but re-registration is not always practical. The ballistic MET message provides a means of determining the corrections necessary for changes in many of the conditions that affect the flight of rounds during the periods between registrations. These conditions include changes in powder temperature, projectile weight, air temperature and density, and the speed and direction of the wind, assuming that all other factors remain relatively constant until the section displaces.

b. The following paragraphs on the MET message provide FDC computers with the rules and procedures for computation of the MET message. For the 107-mm (4.2-in) mortar, firing tables FT 4.2-H-2 provide MET information for M329A1 and M328A1 ammunition. In general, plus (+) signs have been omitted from the firing tables; numbers without signs are considered positive.

c. By themselves, corrections computed from the MET message are not adequate firing corrections. To be of value to the FDC, a valid MET message must be received concurrently (within 4 hours) with a registration. The registration corrects for all nonstandard conditions; a MET received and computed concurrently with the registration tells the FDC how much of the total registration correction is attributable to weather. By comparing the corrections obtained from a later MET message, the FDC can modify the registration corrections to account for changes in weather. The use of MET corrections therefore eliminates the need for re-registration.

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d. The ballistic MET message (figure 1) has two parts: the introduction, which identifies and describes the MET station, and the body, which contains meteorological data. MET messages can normally be obtained from the division artillery MET station every 4 hours. Since MET information is normally broadcast on AM radios, it will come to the FDC through battalion headquarters.

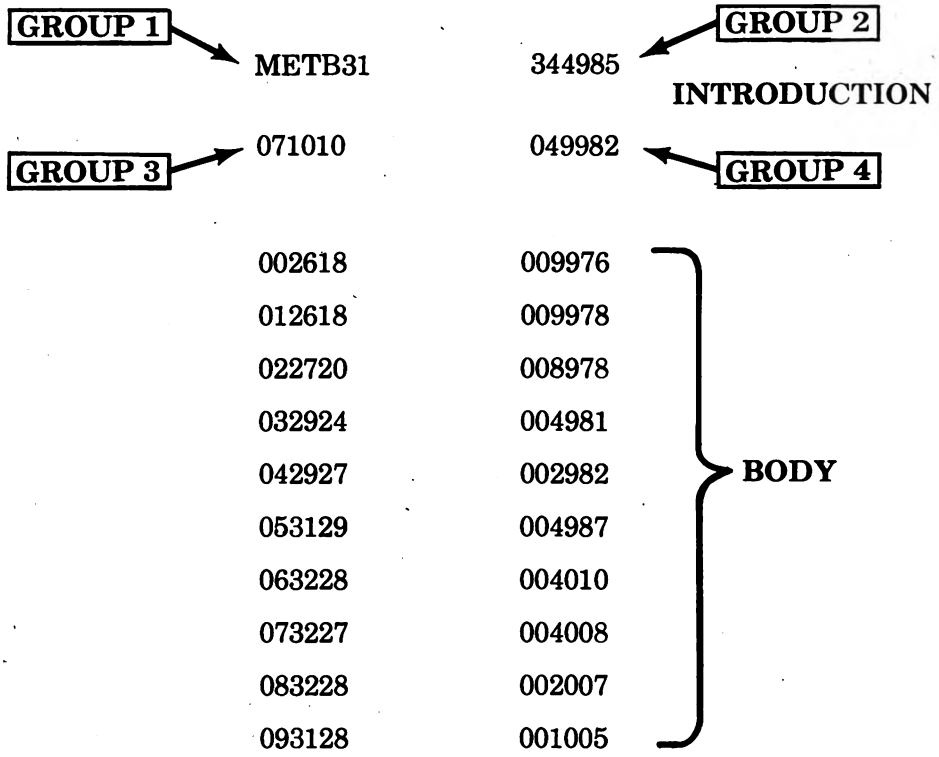

Figure 1. Sample ballistic MET message.

2. Recording the MET Message (DA Form 3675).

a. Format of the MET Message. The MET message is broadcasted in 6-character blocks, as shown in figure 2. The first four 6-character groups are known as the introduction, and are recorded on the top line of the recording form. The rest of the message is the body; two 6-character groups comprise each line of the body.

b. Introduction. The first four 6-character groups of the MET message are the introduction, identifying the type of message and the station transmitting the message. The recording of the introduction on DA Form 3675 (Ballistics MET Message) (figure 2), is discussed below. For a more detailed description of the meaning of each of the characters which make up the introduction, see the introduction section of the firing tables. The meaning of the characters in the introduction recorded in figure 1 follows:

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METB 31 (Group 1)

MET ..... Indicates that the transmission is a meteorological message.

B ..... Indicates that it is a ballistic MET message.

3 ..... Indicates that the message is for surface-to-surface fire.

1 ..... Indicates the octant of the globe in which the meteorological message is applicable.

344985 (Group 2)

344 ..... Indicates the latitude of the center of the area of applicability expressed to the nearest tenth of a degree.

985 ..... Indicates the longitude of the center of the area of applicability expressed to the nearest tenth of a degree. When the longitude is 100 degrees or greater (possible when in octant 1, 2, 6, or 7), the initial digit, 1, is omitted.

071010 (Group 3)

07 ..... Indicates the day of the month the period of validity of the message begins; 07=the seventh day of the month.

101 ..... Indicates to the nearest tenth of an hour in Greenwich Mean Time and the hour the period of validity begins.

0 ..... Indicates the duration of the period of validity in hours. For U.S. Armed Forces, the meteorological data is presumed valid until a later message is provided.

049982 (Group 4)

049 ..... Indicates the altitude of the MET station (also referred to as the meteorological datum plane, or MDP), recorded in tens of meters. The altitude should be written on the recording form exactly as it is received to avoid confusion; 049 written on the sheet means 490 meters.

982 ..... Atmoshperic pressure at the MET station. This value is not used to determine MET corrections for mortars, but is recorded to avoid confusion in recording the message.

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c. Body. The atmosphere is divided into height zones parallel to the meteorological datum plane, as depicted in figure 3. Meteorological conditions are determined for each height zone and recorded in two 6-digit groups. The data for each zone is numbered, beginning at 00 for the zone containing the MET station, and recorded on the line bearing the corresponding number. The data for line 03 is shown below as an example.

032924

03 ..... The first two digits of any line in the body of the MET message indicate its line number. These numbers run sequentially from 00 (surface conditions) up to 15 (18,000 meters); however, with present ammunition only lines 00 through 06 are used since mortar projectiles never exceed the zone height corresponding to line 06. Record the entire MET message to reduce the chance of omitting significant data.

29 ..... Indicates the direction from which the ballistic wind is blowing. It is a grid azimuth expressed in hundreds of mils, e.g., 29 = 2900 mils.

24 ..... Indicates the speed of the ballistic wind expressed to the nearest whole knot; 24 = 24 knots.

004981

004 ..... Indicates the ballistic air temperature expressed to the nearest 0.1% of standard. When the value is equal to or greater than 100, the initial digit, 1, has been omitted in transmission. The computer recording the message may add the 1 for clarity if he desires to do so. Here, 004 = 100.4%.

981 ..... Indicates the ballistic air density expressed to the nearest 0.1% of standard. As with temperature, the initial 1 is omitted in transmission when the value equals or exceeds 100.0. In this case, 981 = 98.1%.

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GROUP 1 GROUP 2 GROUP 3 GROUP 4

BALLISTIC MET MESSAGE

For use of this form, see FM 6-15; the proponent agency is United States Continental Army Command.

IDENTIFICATION	TYPE MSG	OCTANT	LOCATION $L_aL_aL_a$ or xxx	LOCATION $L_oL_oL_o$ or xxx	DATE YY	TIME (GMT) $G_0G_0G_0$	DURATION (HOURS) G	STATION HEIGHT (10's M) hhh	MDP PRESSURE % OF STD PPP
METB	K	Q							
METB	3	1	344985		07	101	0	049	982

ZONE HEIGHT (METERS)	LINE NUMBER ZZ	BALLISTIC WINDS DIRECTION (100's MILS) dd	BALLISTIC WINDS SPEED (KNOTS) FF	BALLISTIC AIR TEMPERATURE (% OF STD) TTT	BALLISTIC AIR DENSITY (% OF STD) ΔΔΔ
SURFACE	00	26	18	009	976
200	01	26	18	009	978
500	02	27	20	008	978
1000	03	29	24	004	981
1500	04	29	27	002	982
2000	05	31	29	004	987
3000	06	32	28	004	010
4000	07	32	27	004	008
5000	08	32	28	002	007
6000	09	31	28	001	005
8000	10				
10000	11				
12000	12				
14000	13				
16000	14				
18000	15				

BODY

REMARKS

DELIVERED TO: RECEIVED FROM:	TIME (GMT)	TIME (LST)

MESSAGE NUMBER	DATE
RECORDER	CHECKED

DA FORM 3675 REPLACES DA FORM 6-57, 1 MAR 62, WHICH IS OBSOLETE.

Figure 2. Proper recording of a MET message on DA Form 3675.

2-V-B-6.5

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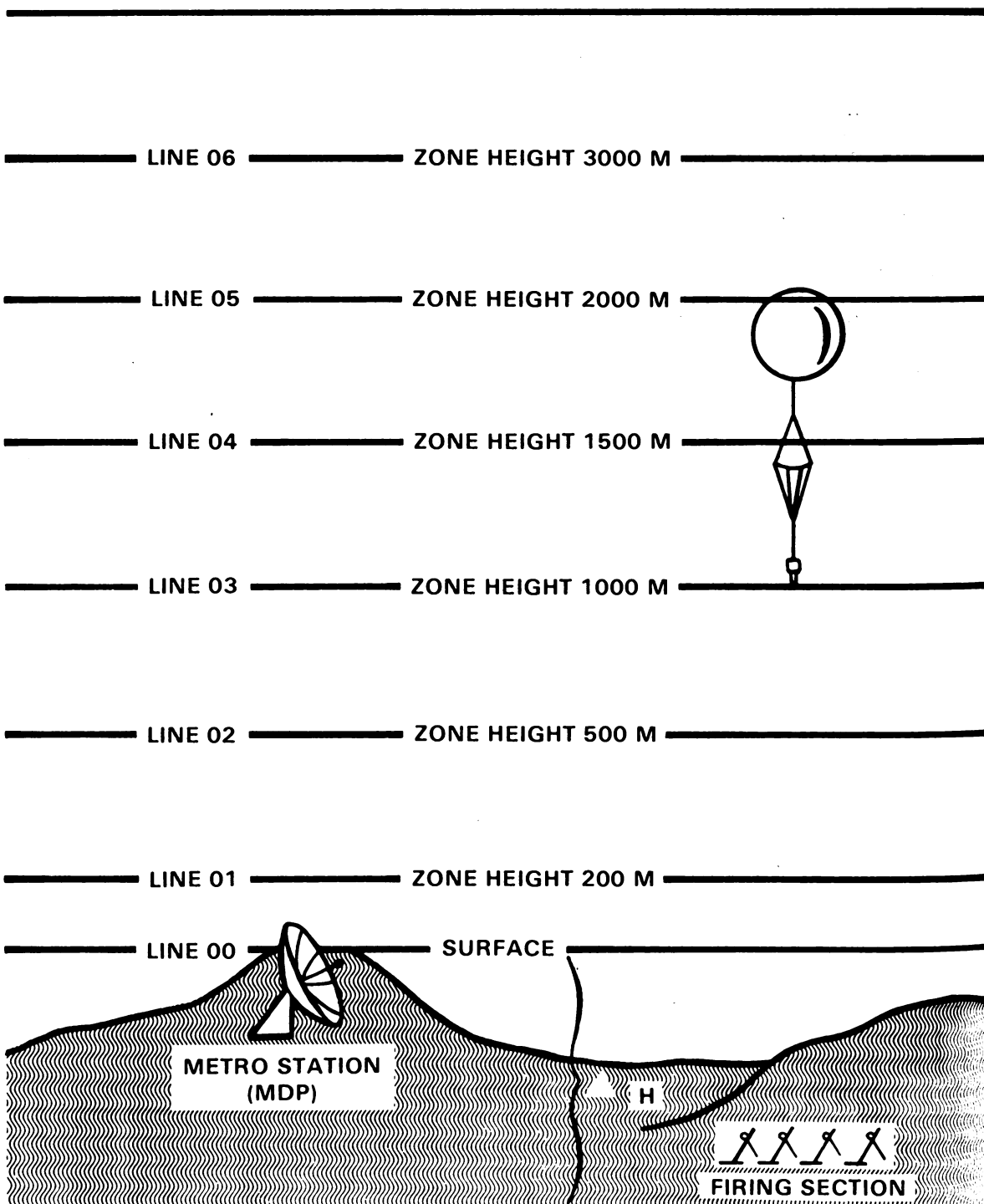

Figure 3. Zone height and difference in height.

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d. Corrections and Omissions. At the end of the transmission of a MET message, the recorder checks to see that his copy is complete. The format of the message enables the recorder to ask for a repetition of only the part he has missed, as in SAY AGAIN INTRODUCTION, or SAY AGAIN LINE 04. When his copy is complete, the recorder reads back the entire message to check it for errors. If line 05 has been recorded incorrectly, the transmitting station would catch the error and report WRONG, LINE 05:053129004987.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 13, page 13-19, para 13-19 and 13-20)
FT 4.2-H-2, Firing Table, 107-mm (4.2-inch) Mortar (Intro, page XXV, para 7)

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TASK NUMBER: 071-322-1615

DETERMINE AND APPLY MET FIRING CORRECTIONS

CONDITIONS:

Given DA Form 2601-1, completed DA Form 3675, and tabular firing tables.

STANDARDS:

Within 60 minutes, record and compute MET data corrections to apply to the nearest mil for deflection and 10 meters for range.

PERFORMANCE MEASURES:

1. **How to fill out DA Form 2601-1, MET Data Correction Sheet for Mortars.**

a. Known Data. Known data is that which is available to the FDC prior to the receipt of a MET message. It is collected by the chief computer from his computers and the section sergeant, and recorded in the proper spaces on the MET data correction sheet when received. Known data consists of the following items:

(1) Charge. This is the most up-to-date firing data charge on the data sheet for the RP. This charge determines which line of the firing tables is consulted to determine the correction factors to be used, and which line of the MET message to use.

(2) Chart range. For purposes of applying MET corrections, the chart range is the distance measured on the firing chart between the plotted locations of the mortars and the RP.

(3) Elevation. The elevation used to determine the adjusted charge; corrections will be taken from the same section of the firing tables.

(4) Direction of fire. For use with the MET, it is measured to the nearest 10 mils from the mortars to the plotted location of the RP, rounded to the nearest 100 mils. It is measured from the firing chart -- or with a surveyed chart, it may be read from the mounting information at the top of the data sheet.

(5) Altitude. The altitude of the firing section is read from the data sheet, rounded to the nearest 10 meters, and recorded in the proper box.

(6) Powder temperature. The temperature of the ammunition propellant at the section is measured to the nearest degree Fahrenheit or centigrade. If the propellant temperature cannot be determined, air temperature can be substituted.

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(7) Projectile weight. Projectile weights vary from lot to lot and among different types of ammunition. The weight, expressed in squares, is normally shown near the lot number. Two squares (2 □) have been set as standard projectile weight.

b. Computation. Once the known data has been recorded on the MET data correction sheet, the transmission of the MET message is awaited. The computation of the MET corrections is quick and more accurate if the computer has organized his thoughts and data before the message is received. Figure 1 shows a MET data correction sheet which indicates the sources, movements, and precisions of the data recorded on the sheet. The following is a guide for organizing MET computation.

(1) Any known data not previously recorded should be written in the proper spaces prior to receipt of the MET message.

(2) Enter the proper subsection of the firing tables, find the firing charge in column 2, read across to find which line of the MET message to use (column 6).

(3) After the MET message is received and recorded on DA Form 3675, extract the information contained in the introduction of the message and in the line of the body determined above, and record this information in the proper spaces of the MET data correction sheet.

(4) Compute corrected values for air temperature and density; determine the chart direction of the wind and the corresponding wind components; and compute the deflection correction.

(5) Compute the MET range correction.

(6) The corrections for deflection and range are rounded to the nearest 1 mil and 10 meters, respectively, and recorded in the THIS MESSAGE box at bottom to determine the correction to apply.

c. Example. The following known data will be used to compute corrections.

Adjusted charge	17 4/8
Chart range	2910 meters
Elevation	900 w/o ext.
Direction of fire	4320 m
Section altitude	460 meters
Ammunition	3 M329A1
Propellant temp	60°F.
Projectile weight	3 □

d. Procedure for using DA Form 2601-1 to compute MET corrections.

(1) Known data. Record all known data in the spaces provided.

(2) Determination of line number. Enter Part I of the firing tables, the section for elevation 900 w/o ext., and search down column 2 until the adjusted charge (17 4/8) is found. Read across to column 6 (5 to FT 81-A1-3) to determine the line number of the MET message to use (in this case, 3).

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(3) MET values. Record the data from the introduction and the appropriate line (03) of the MET message in the proper spaces on DA Form 2601-1 (figure 2). For brevity, the location of the MET station should remain as it appears in the MET message. All other data should be changed to read their actual values: altitude should be changed from 049 to 490; wind direction, from 29 to 2900. Values for the altitude of the MET station, wind direction, and wind speed are used in other sections of the sheet, and should be recorded in these other sections at this time.

(4) Temperature and density corrections. Determining H and corrected values for air temperature and density. H is the difference in altitude between the mortar section and the MDP; the sign is plus if the section is above the MDP and minus if it is below:

Altitude of the MDP	490
-Altitude of mortars	460
H	-30 (Section below MDP)

The H corrections modify the values of air temperature and density determined at the MET station to what they would be at the mortar section. The value for H is used to locate the appropriate corrections in table B (figure 3). Corrections for air temperature (T) and air density (D) are arranged in four double rows in the table. The numbers 0, +100-, +200-, +300-, located in the left column of the table represent H expressed in hundreds of meters; the numbers 0, +10-, through +90- across the top represent H in tens of meters. Where the proper hundreds row crosses the proper tens column, the corrections may be found. The numerical sign of the corrections will be the opposite of the sign of H. In the example H = -30, the corrections are found where the 0 row crosses the +30- column. The sign of H is minus, making the corrections plus: T is +0.1 and D is +0.3. Enter these in the spaces provided on the form and determine the corrected values for temperature and density (figure 3).

(5) Wind components. The wind direction should already have been entered in the proper space, and also the direction of fire. If the direction of fire is larger than the direction of the wind, add 6400 to the latter (4300 is larger than 2900; 2900 + 6400 = 9300). Subtract the direction of fire; the result is the chart direction of the wind (9300 - 4300 = 5000). Enter table A (figure 4) and find the chart direction of the wind just determined. Read across the row to find the cross wind and range wind components (LEFT 0.98 and HEAD 0.20); copy these in the proper spaces. Multiply the components by the wind speed to get lateral wind and range wind. The range wind (24 × LO = L23.5) is multiplied by the correction factor corresponding to the adjusted charge (17 4/8) taken from table D (basic data), column 9 (1, figure 5) to get the deflection correction (L23.5 × 0.9 = L23.5) is multiplied by the correction (L23.5 × 0.9 = L21.2, which rounds to L21). The result is moved to the bottom and placed in the THIS MESSAGE space for deflection correction.

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(6) Range correction. All known values should already be written in the proper spaces except V, which is found as follows. The computer enters table C (figure 6) and finds the temperature closest to that recorded for the propellant (it may be either Fahrenheit or centigrade); V appears in the center column on the same line as the temperature. The computer now determines the amount by which these known values vary from the standard values upon which the firing tables are based. The variations from standard must be multiplied by correction factors from table D (figure 5) to convert them to range corrections in meters. Enter table D (correction factors) on the line corresponding to the adjusted charge (or the range corresponding to the adjusted charge) and find the correction factor for each variation from standard; enter the factor with its sign on the MET sheet. Multiply the variation from standard by the correction factor and place the result (rounded to the nearest whole meter) in the column with the same sign as the correction factor. When all of the corrections have been multiplied, sum the two columns and determine the net correction (36 in the example). Round the result to the nearest ten meters and write it in the range box for THIS MESSAGE.

(7) MET correction. The contribution of meteorological factors at the time the MET was computed in the amount recorded by THIS MESSAGE, here, L21, +40.

2. **Determining and Applying MET Firing Corrections.**

a. Concurrent MET. If the MET is computer concurrent with a registration, the registration corrections compensate for ALL nonstandard conditions, and the MET merely tells how much of the corrections are the result of weather. In this case, the MET correction values are saved to be compared with the values calculated several hours later. The values on the THIS MESSAGE line are recorded on the LAST MESSAGE line of the MET data correction sheet on which the next MET will be computed.

b. Subsequent MET. When a subsequent MET is received and computed, the MET corrections determined can be compared with the corrections determined from the preceding MET to find how much the weather effects on projectiles fired at the RP have changed. Since all other conditions are assumed to be constant, the difference in weather conditions is the only change to compensate for in updating firing corrections.

c. Determining the Correction to Apply. To calculate the correction to apply to the fire control equipment to compensate for meteorological changes, find the change from the LAST MESSAGE corrections to those for THIS MESSAGE. Example: Several hours later, another MET is computed, the corrections being L8, +100. These would appear on the bottom of the MET data correction sheet as follows:

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	Deflection	Range
	(L)	(+)
(1st Subsequent) THIS MESSAGE	21	40
	R	-
	(L)	(+)
(Concurrent MET) LAST MESSAGE	8	100
	R	-
	L	+
CORR TO APPLY		
	R	-

The change in the deflection correction is expressed as the direction and number of mils change from the concurrent MET (L21) to the 1st subsequent MET (L8). The horizontal scale of figure 7 illustrates a convenient method for determining the difference, in this case RIGHT 13. The range change is the difference between the range correction for the concurrent MET (+40) and that for the subsequent MET (+100). The vertical scale of figure 7 shows how to determine the range correction; here, +60. The completed MET CORR TO APPLY section would look like this:

	Deflection	Range
	(L)	(+)
LAST MESSAGE	21	40
	R	-
	(L)	(+)
THIS MESSAGE	8	100
	R	-
	L	(+)
CORR TO APPLY	13	60
	(R)	-

The method for placing the CORR TO APPLY (R13, +60) on the fire control equipment is described in para 2d. If several hours later another MET is received and calculated (call this the second subsequent MET), the corrections to apply would be calculated by finding the changes in deflection and range corrections between the first subsequent MET (which is now in the LAST MESSAGE box) and the second subsequent MET, using exactly the same method as was used before.

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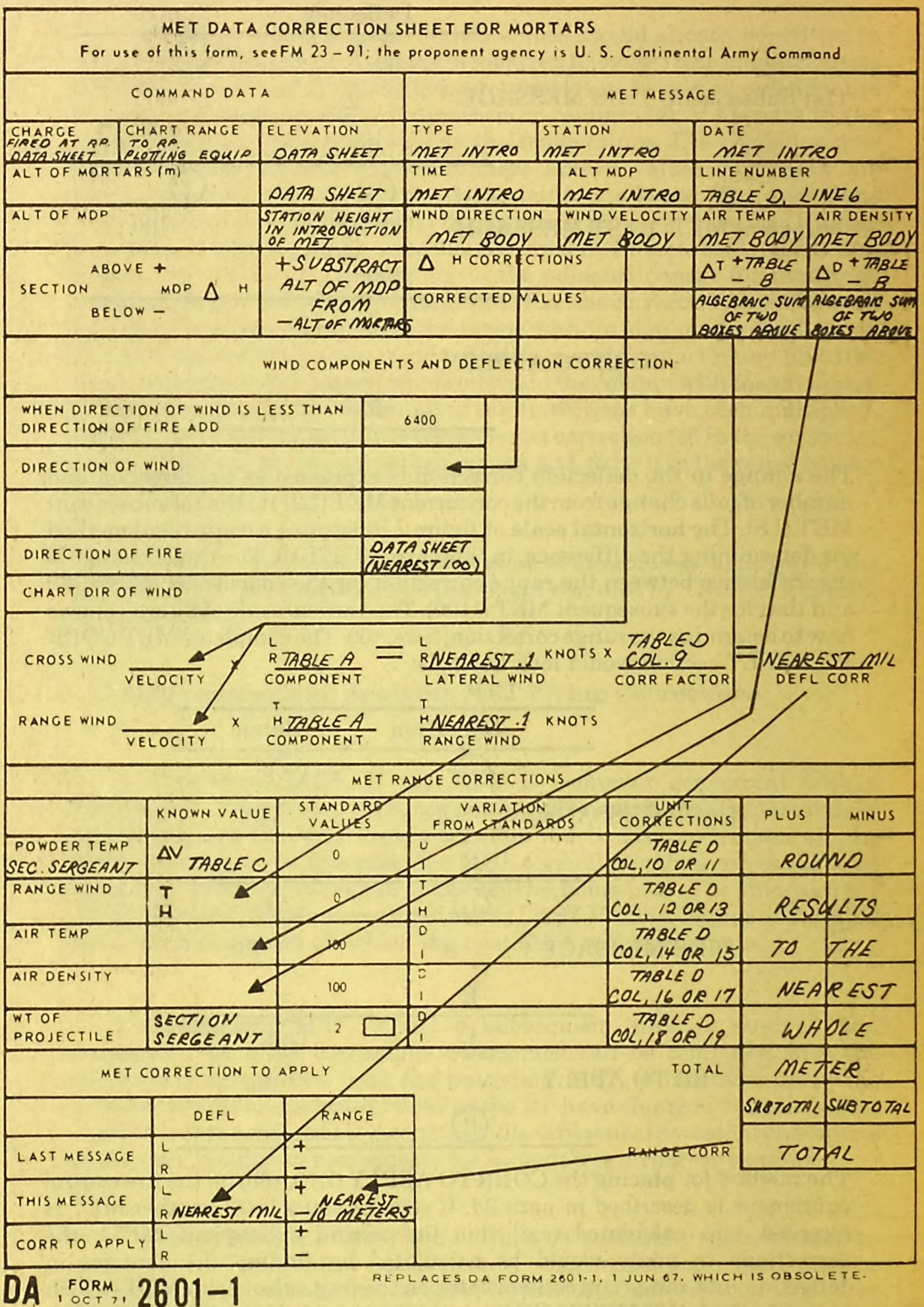

MET DATA CORRECTION SHEET FOR MORTARS

For use of this form, see FM 23 – 91; the proponent agency is U. S. Continental Army Command

COMMAND DATA			MET MESSAGE		
CHARGE FIRED AT RP DATA SHEET	CHART RANGE TO RP PLOTTING EQUIP	ELEVATION DATA SHEET	TYPE MET INTRO	STATION MET INTRO	DATE MET INTRO
ALT OF MORTARS (m)		DATA SHEET	TIME MET INTRO	ALT MDP MET INTRO	LINE NUMBER TABLE D, LINE 6
ALT OF MDP		STATION HEIGHT IN INTRODUCTION OF MET	WIND DIRECTION MET BODY	WIND VELOCITY MET BODY	AIR TEMP MET BODY / AIR DENSITY MET BODY
SECTION ABOVE + / MDP Δ H / BELOW –		+SUBSTRACT ALT OF MDP FROM –ALT OF MORTARS	Δ H CORRECTIONS		Δ^T +TABLE – B / Δ^D +TABLE – B
			CORRECTED VALUES		ALGEBRAIC SUM OF TWO BOXES ABOVE / ALGEBRAIC SUM OF TWO BOXES ABOVE

WIND COMPONENTS AND DEFLECTION CORRECTION

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	6400
DIRECTION OF WIND	
DIRECTION OF FIRE	DATA SHEET (NEAREST 100)
CHART DIR OF WIND	

CROSS WIND ____ VELOCITY x L/R TABLE A COMPONENT = L/R NEAREST .1 LATERAL WIND KNOTS x TABLE D COL. 9 CORR FACTOR = NEAREST MIL DEFL CORR

RANGE WIND ____ VELOCITY x T/H TABLE A COMPONENT = T/H NEAREST .1 RANGE WIND KNOTS

MET RANGE CORRECTIONS

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARDS	UNIT CORRECTIONS	PLUS	MINUS
POWDER TEMP SEC. SERGEANT	ΔV TABLE C	0	U/I	TABLE D COL, 10 OR 11	ROUND	
RANGE WIND	T/H	0	T/H	TABLE D COL, 12 OR 13	RESULTS	
AIR TEMP		100	D/I	TABLE D COL, 14 OR 15	TO	THE
AIR DENSITY		100	D/I	TABLE D COL, 16 OR 17	NEAREST	
WT OF PROJECTILE	SECTION SERGEANT	2 ☐	D/I	TABLE D COL, 18 OR 19	WHOLE	
MET CORRECTION TO APPLY				TOTAL	METER	
					SUBTOTAL	SUBTOTAL
				RANGE CORR	TOTAL	

	DEFL	RANGE
LAST MESSAGE	L/R	+ / –
THIS MESSAGE	L/R NEAREST MIL	+ / –10 METERS NEAREST
CORR TO APPLY	L/R	+ / –

DA FORM 1 OCT 71 2601-1 REPLACES DA FORM 2601-1, 1 JUN 67, WHICH IS OBSOLETE.

Figure 1. DA Form 2601-1, Sources, movements, and precisions of data on the MET data correction sheet.

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MET DATA CORRECTION SHEET FOR MORTARS

For use of this form, see FM 23 – 91; the proponent agency is U. S. Continental Army Command

COMMAND DATA			MET MESSAGE			
CHARGE 17 4/8	CHART RANGE 2910	ELEVATION 900	TYPE S3	STATION 344 985	DATE 07	
ALT OF MORTARS (m)	460		TIME 1000-1400	ALT MDP 490	LINE NUMBER 03	
ALT OF MDP	490		WIND DIRECTION 2900	WIND VELOCITY 24	AIR TEMP	AIR DENSITY
SECTION ABOVE + / MDP / BELOW − Δ H	+ / − 30		Δ H CORRECTIONS		ΔT ± .1	ΔD ± .3
			CORRECTED VALUES		100.5	98.4

WIND COMPONENTS AND DEFLECTION CORRECTION

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	6400
DIRECTION OF WIND	2900
	9300
DIRECTION OF FIRE	−4300
CHART DIR OF WIND	5000

CROSS WIND 24 (VELOCITY) × (L R) .98 (COMPONENT) = (L R) 23.5 (LATERAL WIND) KNOTS × 0.9 (CORR FACTOR) = L21 (DEFL CORR)

RANGE WIND 24 (VELOCITY) × (T H) .20 (COMPONENT) (T H) 4.8 (RANGE WIND) KNOTS

MET RANGE CORRECTIONS

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARDS	UNIT CORRECTIONS	PLUS	MINUS
POWDER TEMP 60 °F	ΔV −0.5	0	(D I) 0.5	+23.9	12	—
RANGE WIND	(T H) 4.8	0	(T H) 4.8	+5.1	24	—
AIR TEMP	100.5	100	(D M) 0.5	0	—	—
AIR DENSITY	98.4	100	(D I) 1.6	−6.7	—	11
WT OF PROJECTILE	3 □	2 □	(D M) 10 □	+11	11	
				TOTAL	47	11
					11	
				RANGE CORR	36	

MET CORRECTION TO APPLY

	DEFL	RANGE
LAST MESSAGE	L R	+ −
THIS MESSAGE	(L R) 21	(+ −) 40
CORR TO APPLY	L R	+ −

DA FORM 1 OCT 71 2601-1

REPLACES DA FORM 2601-1, 1 JUN 67, WHICH IS OBSOLETE.

Figure 2. DA Form 2601-1 (MET data correction sheet for mortars).

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TABLE B

AIR TEMPERATURE AND DENSITY CORRECTIONS

FT 4.2-H-2

900m

PROJECTILE, HE, M329A1
W/O EXTENSION
FUZE, PD, M557

CORRECTIONS TO TEMPERATURE (△ T) AND DENSITY (△ D), IN PERCENT, TO COMPENSATE FOR THE DIFFERENCE IN ALTITUDE, IN METERS, BETWEEN THE BATTERY AND THE MDP

△ H		0	+10	+20-	+30-	+40-	+50-	+60-	+70-	+80-	+90-
0	△ T	0.0	0.0	0.0	-0.1+	-0.1+	-0.1+	-0.1+	-0.2+	-0.2+	-0.2+
	△ D	0.0	-0.1+	-0.2+	-0.3+	-0.4+	-0.5+	-0.6+	-0.7+	-0.8+	-0.9+
+100-	△ T	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.3+	-0.3+	-0.4+	-0.4+	-0.4+
	△ D	-1.0+	-1.1+	-1.2+	-1.3+	-1.4+	-1.5+	-1.6+	-1.7+	-1.8+	-1.9+
+200-	△ T	-0.5+	-0.5+	-0.5+	-0.6+	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+
	△ D	-2.0+	-2.1+	-2.2+	-2.3+	-2.4+	-2.5+	-2.6+	-2.7+	-2.8+	-2.9+
+300-	△ T	-0.7+	-0.7+	-0.7+	-0.7+	-0.8+	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+
	△ D	-3.0+	-3.1+	-3.2+	-3.3+	-3.4+	-3.5+	-3.6+	-3.7+	-3.8+	-3.9+

NOTE: △ H IS THE HEIGHT OF THE BATTERY, IN METERS, WITH REFERENCE TO THE MDP. IF THE BATTERY IS ABOVE THE MDP, USE THE SIGN THAT PRECEDES THE NUMBER. IF THE BATTERY IS BELOW THE MDP, USE THE SIGN THAT FOLLOWS THE NUMBER.

Figure 3. Table B, air temperature and density corrections.

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TABLE A

FT 4.2-H-2 WIND COMPONENTS

PROJECTILE, HE, M329A1
W/O EXTENSION
FUZE, PD, M557

900m

CORRECTION COMPONENTS OF A ONE KNOT WIND

CHART DIRECTION OF WIND	CROSS WIND	RANGE WIND	CHART DIRECTION OF WIND	CROSS WIND	RANGE WIND
MIL	KNOT	KNOT	MIL	KNOT	KNOT
0	0	H1.00	3200	0	T1.00
100	R.10	H.99	3300	L.10	T.99
200	R.20	H.98	3400	L.20	T.98
300	R.29	H.96	3500	L.29	T.96
400	R.38	H.92	3600	L.38	T.92
500	R.47	H.88	3700	L.47	T.88
600	R.56	H.83	3800	L.56	T.83
700	R.63	H.77	3900	L.63	T.77
800	R.71	H.71	4000	L.71	T.71
900	R.77	H.63	4100	L.77	T.63
1000	R.83	H.56	4200	L.83	T.56
1100	R.88	H.47	4300	L.88	T.47
1200	R.92	H.38	4400	L.92	T.38
1300	R.96	H.29	4500	L.96	T.29
1400	R.98	H.20	4600	L.98	T.20
1500	R.99	H.10	4700	L.99	T.10
1600	R1.00	0	4800	L1.00	0
1700	R.99	T.10	4900	L.99	H.10
1800	R.98	T.20	5000	L.98	H.20
1900	R.96	T.29	5100	L.96	H.29
2000	R.92	T.38	5200	L.92	H.38
2100	R.88	T.47	5300	L.88	H.47
2200	R.83	T.56	5400	L.83	H.56
2300	R.77	T.63	5500	L.77	H.63
2400	R.71	T.71	5600	L.71	H.71
2500	R.63	T.77	5700	L.63	H.77
2600	R.56	T.83	5800	L.56	H.83
2700	R.47	T.88	5900	L.47	H.88
2800	R.38	T.92	6000	L.38	H.92
2900	R.29	T.96	6100	L.29	H.96
3000	R.20	T.98	6200	L.20	H.98
3100	R.10	T.99	6300	L.10	H.99
3200	0	T1.00	6400	0	H1.00

Figure 4. Table A - wind components.

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900m

TABLE D

FT 4.2-H-2

BASIC DATA

CTG, HE, M329A1
W/O EXTENSION
FUZE, PD, M557

1	2	3	4	5	6	7	8	9
RANGE	CHARGE	D CHG PER 100 M DR	FS FOR GRAZE BURST FUZE M564	DR PER 1/8 INC D CHG	LINE NO.	TIME OF FLIGHT	AZIMUTH CORRECTIONS	
							DRIFT (CORR TO L)	CW OF 1 KNOT
M	INC	INC		M	NO.	SEC	MIL	MIL
2410	14	5/8	25.6	21	3	25.8	36.5	0.8
2430	14-1/8	5/8	25.7	21	3	25.9	36.7	0.8
2450	14-2/8	5/8	25.8	21	3	26.0	36.8	0.8
2470	14-3/8	5/8	25.9	21	3	26.2	36.9	0.8
2490	14-4/8	5/8	26.0	21	3	26.3	37.0	0.9
2510	14-5/8	5/8	26.2	21	3	26.4	37.2	0.9
2530	14-6/8	5/8	26.3	21	3	26.5	37.3	0.9
2550	14-7/8	5/8	26.4	21	3	26.6	37.4	0.9
2570	15	5/8	26.5	21	3	26.8	37.5	0.9
2590	15-1/8	5/8	26.6	21	3	26.9	37.6	0.9
2620	15-2/8	5/8	26.8	21	3	27.0	37.8	0.9
2640	15-3/8	5/8	26.9	21	3	27.1	37.9	0.9
2660	15-4/8	5/8	27.0	21	3	27.2	38.0	0.9
2680	15-5/8	5/8	27.1	21	3	27.3	38.2	0.9
2700	15-6/8	5/8	27.2	21	3	27.5	38.3	0.9
2720	15-7/8	5/8	27.3	21	3	27.6	38.4	0.9
2740	16	5/8	27.5	21	3	27.7	38.5	0.9
2760	16-1/8	5/8	27.6	21	3	27.8	38.7	0.9
2780	16-2/8	5/8	27.7	21	3	27.9	38.8	0.9
2800	16-3/8	5/8	27.8	21	3	28.0	38.9	0.9
2830	16-4/8	5/8	27.9	21	3	28.2	39.1	0.9
2850	16-5/8	5/8	28.0	21	3	28.3	39.2	0.9
2870	16-6/8	5/8	28.2	21	3	28.4	39.3	0.9
2890	16-7/8	5/8	28.3	21	3	28.5	39.4	0.9
2910	17	5/8	28.4	21	3	28.6	39.6	0.9
2930	17-1/8	5/8	28.5	21	3	28.7	39.7	0.9
2950	17-2/8	5/8	28.6	21	3	28.8	39.8	0.9
2970	17-3/8	5/8	28.7	21	3	29.0	40.0	0.9
3000	17-4/8	5/8	28.8	21	3	29.1	40.1	0.9
3020	17-5/8	5/8	29.0	21	3	29.2	40.2	0.9
3040	17-6/8	5/8	29.1	21	3	29.3	40.4	0.9
3060	17-7/8	5/8	29.2	21	3	29.4	40.5	0.9
3080	18	5/8	29.3	21	3	29.5	40.6	0.9
3100	18-1/8	5/8	29.4	21	3	29.6	40.8	0.9
3120	18-2/8	5/8	29.5	22	3	29.8	40.9	0.9
3150	18-3/8	5/8	29.7	22	3	29.9	41.0	0.9
3170	18-4/8	5/8	29.8	22	3	30.0	41.1	0.9

Figure 5. Table D - Basic data.

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FT 4.2-H-2 TABLE D

CTG, HE, M329A1 W/O EXTENSION FUZE, PD, M557 CORRECTION FACTORS

900m

1	10	11	12	13	14	15	16	17	18	19
RANGE	RANGE CORRECTIONS FOR									
	MUZZLE VELOCITY 1 M S		RANGE WIND 1 KNOT		AIR TEMP 1 PCT		AIR DENSITY 1 PCT		PROJ WT OF 1 SQ 2 SQ STD	
	DEC	INC	HEAD	TAIL	DEC	INC	DEC	INC	DEC	INC
M	M	M	M	M	M	M	M	M	M	M
2410	23.0	-22.6	3.8	-2.8	0.0	0.0	-4.5	4.6	-9	10
2430	23.1	-22.6	3.8	-2.8	0.0	0.0	-4.5	4.7	-9	10
2450	23.1	-22.7	3.9	-2.8	0.0	0.0	-4.6	4.7	-9	10
2470	23.1	-22.7	3.9	-2.9	0.0	0.0	-4.7	4.8	-10	10
2490	23.2	-22.8	4.0	-2.9	0.0	0.0	-4.8	4.9	-10	10
2510	23.2	-22.8	4.0	-2.9	0.0	0.0	-4.8	5.0	-10	10
2530	23.3	-22.8	4.1	-3.0	0.0	0.0	-4.9	5.1	-10	10
2550	23.3	-22.9	4.1	-3.0	0.0	0.0	-5.0	5.1	-10	10
2570	23.3	-22.9	4.2	-3.0	0.0	0.0	-5.1	5.2	-10	10
2590	23.4	-23.0	4.2	-3.1	0.0	0.0	-5.1	5.3	-10	10
2620	23.4	-23.0	4.2	-3.1	0.0	0.0	-5.2	5.4	-10	10
2640	23.4	-23.0	4.3	-3.1	0.0	0.0	-5.3	5.4	-10	10
2660	23.4	-23.1	4.3	-3.2	0.0	0.0	-5.4	5.5	-10	10
2680	23.5	-23.1	4.4	-3.2	0.0	0.0	-5.5	5.6	-10	10
2700	23.5	-23.1	4.4	-3.2	0.0	0.0	-5.5	5.7	-10	10
2720	23.5	-23.2	4.5	-3.3	0.0	0.0	-5.6	5.8	-10	10
2740	23.6	-23.2	4.5	-3.3	0.0	0.0	-5.7	5.9	-10	10
2760	23.6	-23.2	4.6	-3.3	0.0	0.0	-5.8	5.9	-10	10
2780	23.6	-23.3	4.6	-3.4	0.0	0.0	-5.9	6.0	-10	10
2800	23.6	-23.3	4.6	-3.4	0.0	0.0	-5.9	6.1	-10	10
2830	23.7	-23.3	4.7	-3.4	0.0	0.0	-6.0	6.2	-10	10
2850	23.7	-23.4	4.7	-3.5	0.0	0.0	-6.1	6.3	-10	10
2870	23.7	-23.4	4.8	-3.5	0.0	0.0	-6.2	6.4	-10	11
2890	23.7	-23.4	4.8	-3.6	0.0	0.0	-6.3	6.5	-10	11
2910	23.8	-23.5	4.9	-3.6	0.0	0.0	-6.4	6.6	-10	11
2930	23.8	-23.5	4.9	-3.6	0.0	0.0	-6.4	6.7	-10	11
2950	23.8	-23.5	5.0	-3.7	0.0	0.0	-6.5	6.7	-10	11
2970	23.8	-23.6	5.0	-3.7	0.0	0.0	-6.6	6.8	-10	11
3000	23.9	-23.6	5.1	-3.7	0.0	0.0	-6.7	6.9	-10	11
3020	23.9	-23.6	5.1	-3.8	0.0	0.0	-6.8	7.0	-10	11
3040	23.9	-23.6	5.2	-3.8	0.0	0.0	-6.9	7.1	-10	11
3060	23.9	-23.7	5.2	-3.9	0.0	0.0	-7.0	7.2	-11	11
3080	23.9	-23.7	5.3	-3.9	0.0	0.0	-7.1	7.3	-11	11
3100	24.0	-23.7	5.3	-3.9	0.0	0.0	-7.2	7.4	-11	11
3120	24.0	-23.7	5.3	-4.0	0.0	0.0	-7.2	7.5	-11	11
3150	24.0	-23.8	5.4	-4.0	0.0	0.0	-7.3	7.6	-11	11
3170	24.0	-23.8	5.4	-4.0	0.0	0.0	-7.4	7.7	-11	11

Figure 5. Continued - Correction factors.

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TABLE C

PROPELLENT TEMPERATURE

FT 4.2-H-2

PROJECTILE, HE, M329A1
W/O EXTENSION
FUZE, PD, M557

900m

CHANGES IN MUZZLE VELOCITY FOR PROPELLANT TEMPERATURE

TEMPERATURE OF PROPELLANT DEGREES F	CHANGE IN VELOCITY M/S	TEMPERATURE OF PROPELLANT DEGREES C
-40	-5.5	-40.0
-35	-5.2	-37.2
-30	-5.0	-34.4
-25	-4.7	-31.7
-20	-4.4	-28.9
-15	-4.2	-26.1
-10	-3.9	-23.3
-5	-3.7	-20.6
0	-3.4	-17.8
5	-3.1	-15.0
10	-2.9	-12.2
15	-2.6	-9.4
20	-2.4	-6.7
25	-2.1	-3.9
30	-1.9	-1.1
35	-1.7	1.7
40	-1.4	4.4
45	-1.2	7.2
50	-0.9	10.0
55	-0.7	12.8
60	-0.5	15.6
65	-0.2	18.3
70	0.0	21.1
75	0.2	23.9
80	0.5	26.7
85	0.7	29.4
90	0.9	32.2
95	1.1	35.0
100	1.3	37.8
105	1.6	40.6
110	1.8	43.3
115	2.0	46.1
120	2.2	48.9
125	2.4	51.7
130	2.6	54.4

Figure 6. Table C - propellant temperature.

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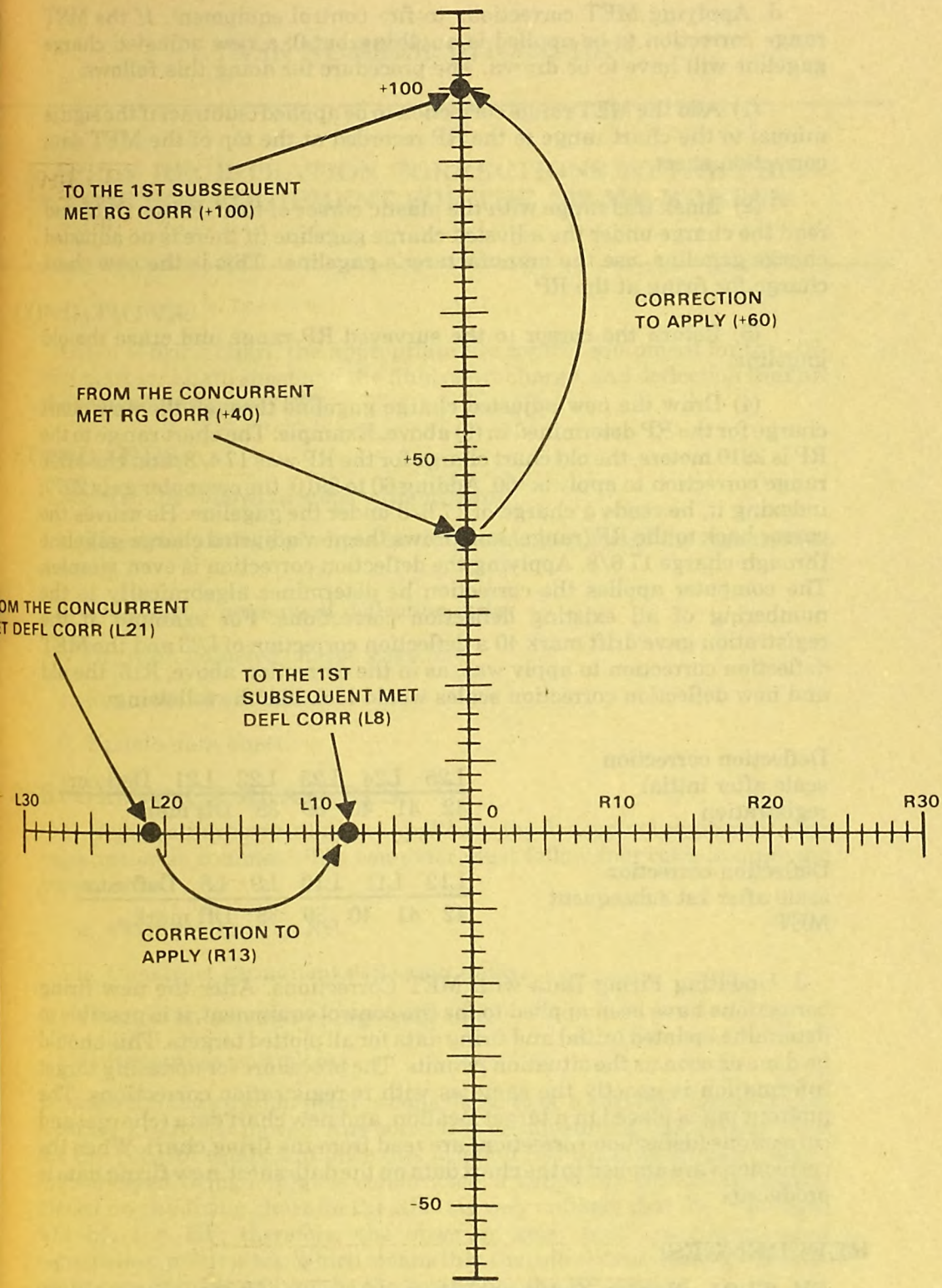

Figure 7. Graphical method for determining the MET corrections to apply to plotting equipment.

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d. Applying MET corrections to fire control equipment. If the MET range correction to be applied is anything but 0, a new adjusted charge gageline will have to be drawn. The procedure for doing this follows:

(1) Add the MET range correction to be applied (subtract if the sign is minus) to the chart range to the RP recorded at the top of the MET data correction sheet.

(2) Index this range with the plastic cursor of the GFF (or GFS) and read the charge under the adjusted charge gageline (if there is no adjusted charge gageline, use the manufacturer's gageline). This is the new chart charge for firing at the RP.

(3) Return the cursor to the surveyed RP range and erase the old gageline.

(4) Draw the new adjusted charge gageline through the new chart charge for the RP determined in (2) above. Example: The chart range to the RP is 2910 meters, the old chart charge for the RP was 17 4/8, and the MET range correction to apply is +60. Adding 60 to 2910, the computer gets 2970; indexing it, he reads a charge of 17 6/8 under the gageline. He moves the cursor back to the RP (range) and draws the new adjusted charge gageline through charge 17 6/8. Applying the deflection correction is even simpler. The computer applies the correction he determines algebraically to the numbering of all existing deflection corrections. For example, if the registration gave drift mark 40 a deflection correction of L23 and the MET deflection correction to apply was, as in the correction above, R13, the old and new deflection correction scales would look like the following:

Deflection correction scale after initial registration	L25	L24	L23	L22	L21	Defl corr
	42	41	40	39	38	Dft mark

Deflection correction scale after 1st subsequent MET	L12	L11	L10	L9	L8	Defl corr
	42	41	40	39	38	Dft mark

3. Updating Firing Data with MET Corrections. After the new firing corrections have been applied to the fire control equipment, it is possible to determine updated initial and firing data for all plotted targets. This should be done as soon as the situation permits. The procedure for updating target information is exactly the same as with re-registration corrections. The plotting pin is placed in a target location, and new chart data (charge) and corrections (deflection correction) are read from the firing chart. When the corrections are applied to the chart data on the data sheet, new firing data is produced.

REFERENCES:

FM 23-91, Mortar Gunnery (chap 13, page 13-24, para 13-22)
FT 4.2-H-2, Firing Table, 107-mm Mortar (Intro, page XXXI, para 8)

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TASK NUMBER: 071-322-1616

APPLY REGISTRATION CORRECTIONS TO THE FIRE CONTROL EQUIPMENT FOR THE 107-MM MORTAR

CONDITIONS:

Given a firing chart, the appropriate fire control equipment for the 107-mm mortar, a data sheet and the final chart charge, and deflection that hit the registration point (RP).

STANDARDS:

Perform the following steps without error:

1. Place the plotting pin back in the plotted location of the registration point.

2. Construct a permanent deflection index.

3. Draw an adjusted charge gage line.

4. Renumber drift blocks.

5. Update data sheet.

PERFORMANCE MEASURES:

1. Registration corrections are applied to the fire control equipment after registration is complete. The computer must follow four rules in applying corrections:

   a. Place pin back in RP.

   b. Construct permanent deflection index.

   c. Draw an adjusted charge gage line.

   d. Renumber drift blocks.

Because the registration point is considered to be a surveyed location, this location will not be moved. Any correction or adjustment must be applied to the fire control equipment once this location has been hit. Initially, when the surveyed firing charge is constructed, a temporary deflection index is placed on the firing chart for the RP. It is very unlikely that the first round will hit the RP; therefore, the observer must send corrections until registration point is hit. Which means that the initial data read from the fire control equipment will not be the same once the RP is hit.

2. To apply registration correction to the fire control equipment, first place the plotting pin back in the surveyed location of the RP, then with the Graphical Firing Fan (GFF) engaged with the vertex pin at the mortar

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location, move the left edge of the range arm tightly against the plotting pin in the RP. At this point, a permanent deflection index must be constructed on the firing chart at the final deflection that hit the RP. The temporary deflection index is erased from the firing chart. With the left edge of the range arm of the GFF still tightly against the pin in the RP, the sliding cursor should also be held tightly against the pin in the RP, to permit an adjusted charge gage line to be drawn on the sliding cursor. The line is drawn from the RP through the final chart charge that hit the RP. The drift mark that the adjusted charge gage line comes closest to on the ballistic plate will be renumbered as "0" and the drift marks will be renumbered as left corrections as range increases and right corrections as range decreases (figure 1).

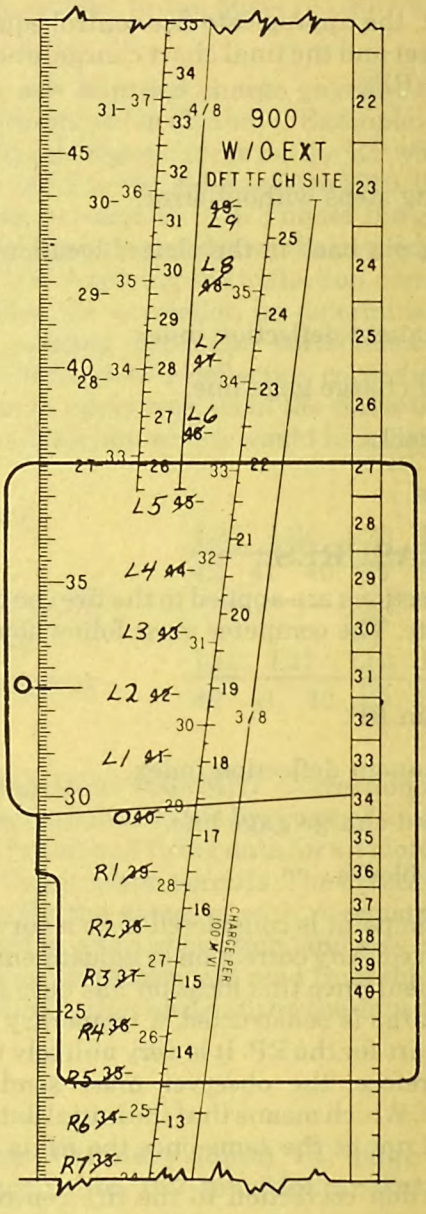

Figure 1.

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3. As range increases, drift will increase to the right. To correct for it, corrections must increase to the LEFT as range increases. It is apparent that, for the trajectory of the round to be a smooth curve, deflection corrections must be consecutive numbers. If drift mark 40 is renumbered 0, then 41 would be L1 and 39 would be R1. Figure 1 shows the ballistic plate of the GFF properly numbered.

4. Over what size area of the battlefield are these corrections valid? Transfer limits define the area in which, if the observer locates the target to survey accuracy, the section can expect to fire for effect successfully without first conducting an adjustment. They prescribe the size of the area in which corrections are valid. For the 107-mm mortar, transfer limits are 400 mils right and left of the RP, and 1,500 meters over and short of it, as shown in figure 2. Outside this area, the corrections are normally used in the absence of anything more accurate, but the computer should be aware that an adjustment onto the target is necessary (figure 2).

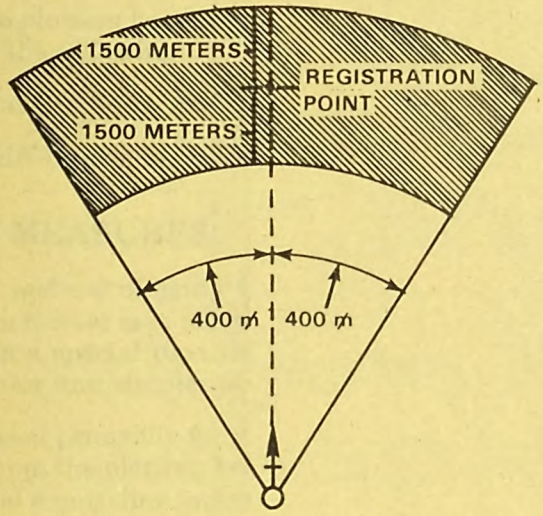

Figure 2. Transfer limits.

5. Any time a large area is to be supported, especially a 6400-mil area, several RPs should be chosen and registered. Each one will probably require a different adjusted charge gage line and a different deflection correction scale. A different cursor may be used for each RP, or two or three different charge gage lines may be drawn on each. In either case, each gage line should be clearly marked with the number of the RP to which it applies. Numbering two or more deflection correction scales on the ballistic plate is out of the question. Instead, a small scale is drawn on an unused edge of the firing chart or the back of the data sheet for each RP. One column has the numbering of the drift marks from the ballistic plate, and the other column has the deflection correction for each drift mark. As with the charge gage lines, deflection correction scales must be carefully numbered with the identification of the RP to which they pertain.

REFERENCES:

FM 23-91, Mortar Gunnery, Dec 71 (chap 12, page 12-27, para 12-22)

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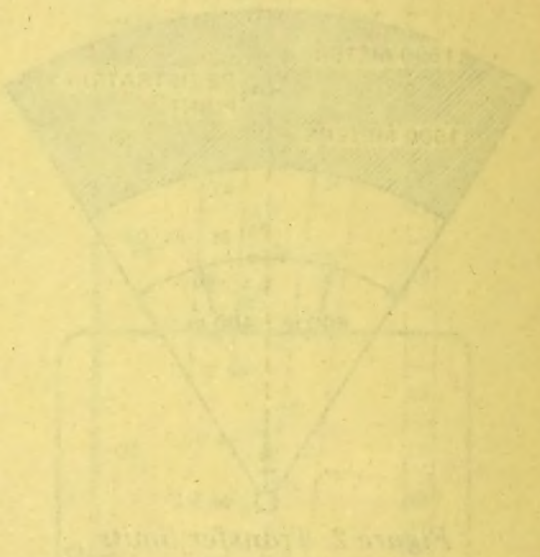

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TASK NUMBER: 071-322-1617

DETERMINE DATA FOR 107-MM (4.2-IN) MORTAR USING THE M16 PLOTTING BOARD AND GFS

CONDITIONS:

Given an M16 plotting board, graphical firing scale (GFS), computer's record, direction and distance to a target, and a call for fire.

STANDARDS:

Prepare the M16 plotting board as an observed firing chart and the GFS for use to include the following:

1. Target, mortar positions, and deflection scale on M16 without error.
2. Renumber drift blocks on GFS without error.

PERFORMANCE MEASURES:

1. The simplest method of using the M16 plotting board to control the fires of the 107-mm mortar is in conjunction with the graphical firing scale (GFS). The GFS is a special type slide rule used to obtain ballistic data, which is much faster and simpler to use than the tabular firing table.

2. The GFS is used primarily for determining charges corresponding to ranges obtained from the plotting board. On the GFS is a sliding cursor on which will be found a crossline (manufacture's gage line) which is used as an index line for reading data.

3. The range scale is the basic scale on the GFS; all other scales are read with reference to the range scale. One side has the data for elevation 900 with and without extension. The other side has data for elevation 800 with and without extension, plus elevation 1065 without extension. To fire elevation 1065 with extension, the computer must use the tabular firing table.

EXAMPLE: Data obtained from GFS for a range of 4660m, using elevation 900 w/ext. (figure 1).

1. Charge - 33 6/8

2. Site - 4/8

3. Drift - 32

4. Time of flight (TF) - 37.2

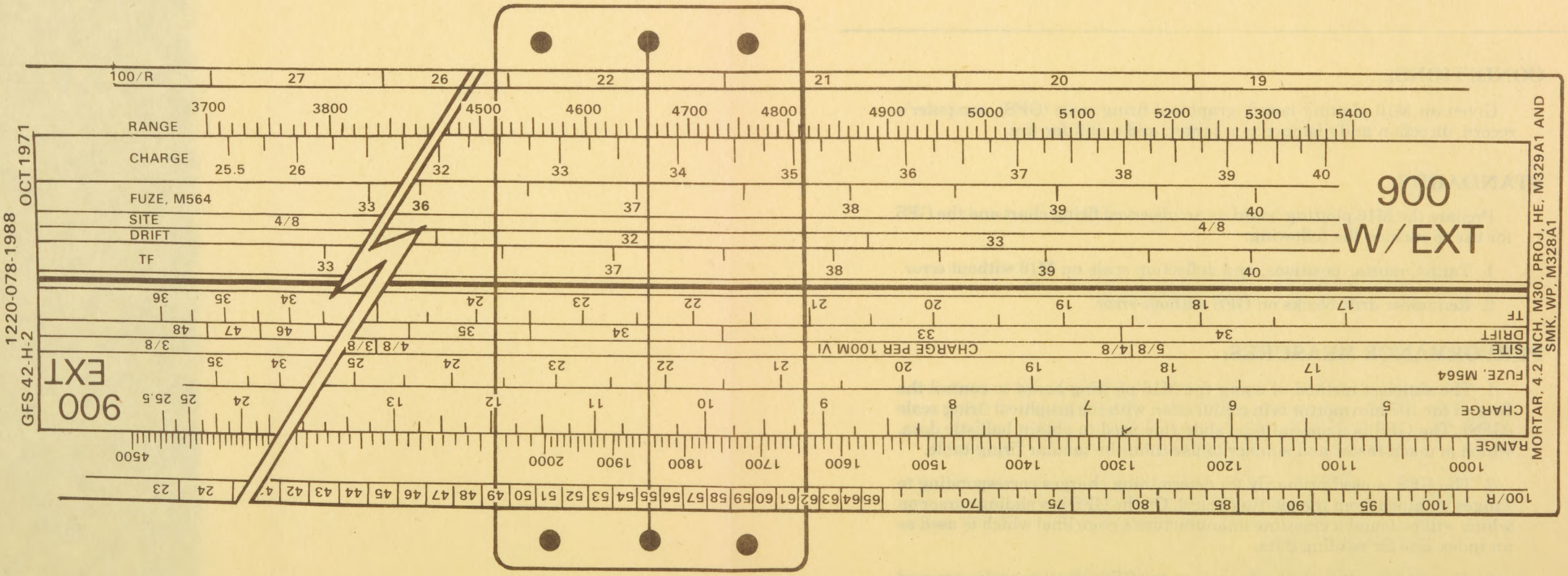

Figure 1.

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The same, exact information found on the graphical firing fan (GFF) is found on the GFS and is used in the same way.

4. The computer, after determining the direction of fire and range to the target, uses the GFS to determine the drift which, when applied to the rounded-off direction of fire, will give him the mounting azimuth.

EXAMPLE:

DOF	4030
Rounded-off DOF	4050
Drift	-32
Mounting azimuth	4018

Data when known or determined should be recorded on the data sheet and computer's record.

5. Knowing the direction of fire and the rounded-off direction of fire, the deflection scale can be superimposed on the M16 plotting board, which is done in the same manner as for the 81-mm mortar. To plot the mortar position, index the direction of fire at the index mark, 4030, then drop 3000 meters below the pivot point and 500 meters to the right of the vertical center line. Construct a hollow cross with an "M" in the upper right corner (figure 2). To plot the target, make sure the direction of fire is indexed. Using the alternate range scale, measure the range on the edge of a computer's record, apply this to the mortar by placing one point at the mortar, go straight up the board to the range indicated, make a small plot, circle it, and label it number 1 (figure 2).

6. In receiving a call for fire, computing data, and placing fire on target, the computer's record is used in the same manner for the M16 plotting board as for the firing chart with the exception that range is recorded.

7. When using an observed firing chart, the location of the target and the mortar position are not known to survey accuracy; therefore, there are no deflection or range corrections to determine or apply. But corrections for drift will be applied as deflection correction. The drift for the range to the target is known (range 4660m, drift 32), but if a greater or shorter range is fired, the drift will differ. To compute for this, the drift blocks must be renumbered. The drift at range 4660 is 32. In renumbering the drift block, the 32 block becomes 0 and 33 becomes L1, 34 becomes L2, 31 becomes R1, and 30 becomes R2 until all drift blocks are renumbered (figure 3).

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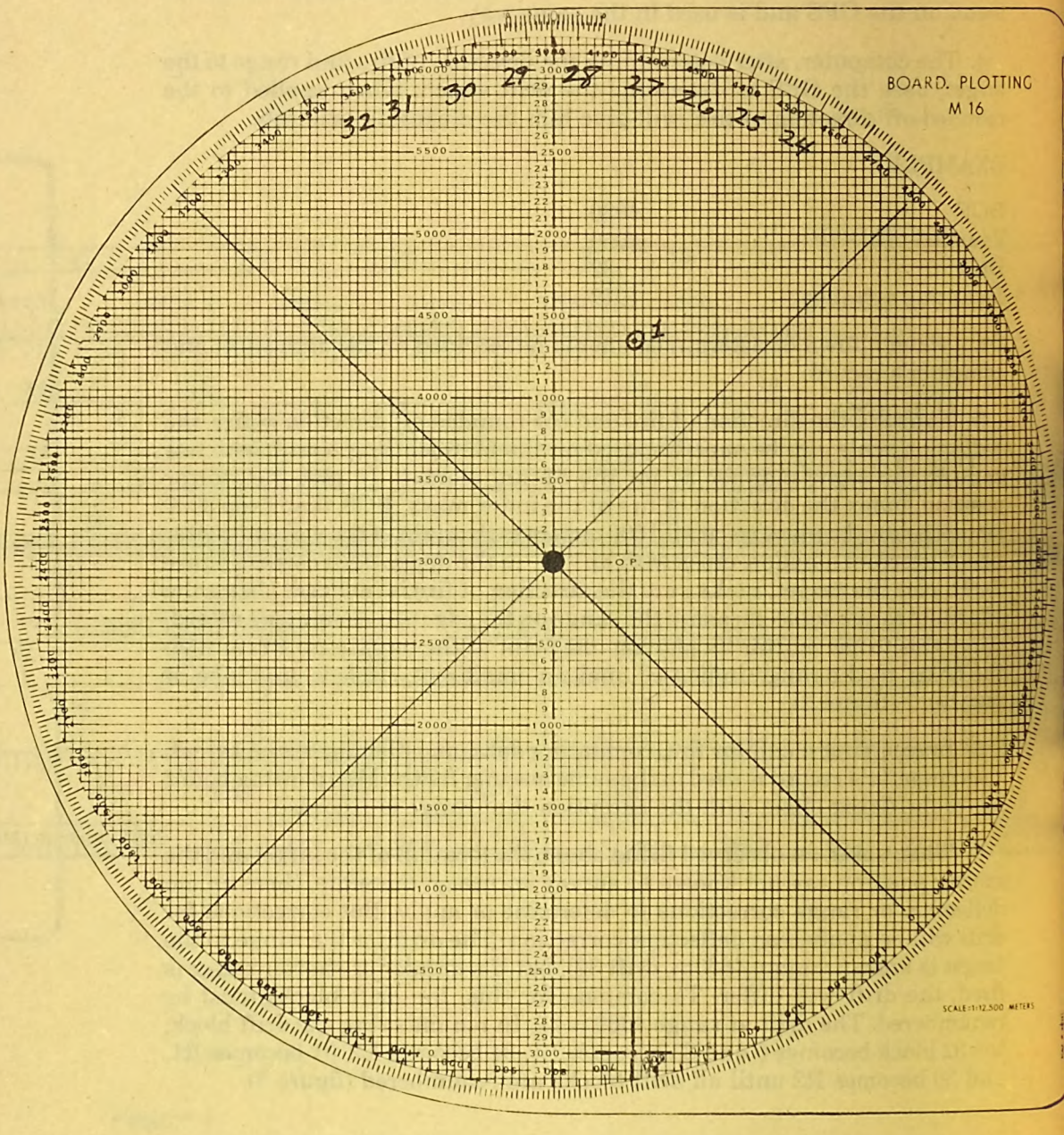

Figure 2.

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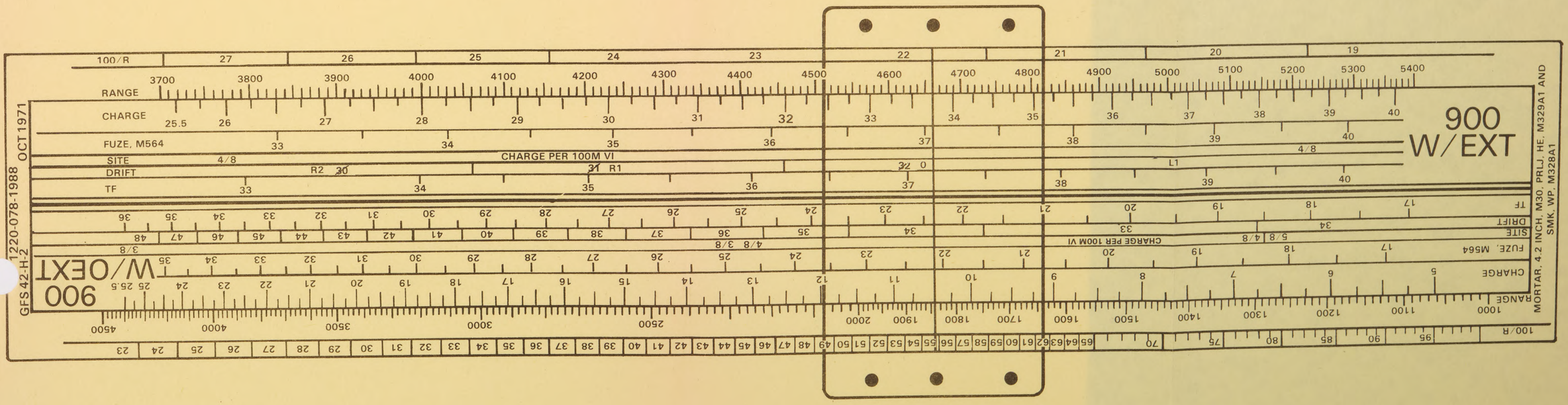

Figure 3.

REFERENCE:

FM 23-91, Mortar Gunnery, Dec 71 (chap 12, page 12-27, para 12-22; chap 15, page 15-19, para 15-22)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION VI
COMMUNICATIONS

TASK SUMMARIES

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TASK NUMBER: 113-600-3001

PERFORM OPERATOR PREVENTIVE MAINTENANCE ON TELEPHONE SET (TA-312/PT OR TA-1)

CONDITIONS:

You are in a field training exercise or performing required garrison maintenance. Given an installed operational TA-1 or TA-312 telephone set, blank DA Form 2404, (TL 13A if required), 3 feet of WD-1/TT wire, cleaning compound (FSN: 7930-395-8542), clean rags, a brush, TM 11-5805-201-12 or TM 11-5805-243-12, and TM 38-750.

STANDARDS:

1. Perform all prescribed operator maintenance steps as required by the appropriate TM.

2. Complete DA Form 2404 IAW TM 38-750, para 3-4.

PERFORMANCE MEASURES:

1. Perform all prescribed operator maintenance steps for the TA-312, IAW TM 11-5805-201-12, para 4-2, pages 4-4 thru 4-5.

2. Perform all prescribed operator maintenance steps for the TA-1, IAW TM 11-5805-243-12, para 21 thru 23, pages 11 thru 14.

3. Conduct, as a minimum, the following services on either telephone set.

a. Check for completeness.

b. Check for proper installation.

c. Check for cleanliness.

d. Check battery compartment for cleanliness and foreign matter (TA-312 only).

e. Check H-60/PT for proper seating in retaining cradle (TA-312 only).

f. Check binding post for tight connection.

g. Check to see that all controls, knobs, and switches operate properly without binding.

h. Check reception and transmission of telephone set.

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4. Previously reported faults beyond the operator's capability to repair or those requiring parts are recorded on the Uncorrected Fault Record (DA Form 2408-14) in the logbook. This form is completed by organizational maintenance.

5. Faults which the operator cannot correct or which require a part are recorded on DA Form 2404 IAW procedures outlined in paragraph 3-4 of TM 38-750.

REFERENCES:

TM 11-5805-201-12, Telephone Set TA-312/PT, C1, Jun 67 (chap 4-2, pages 4-4 thru 4-5, para 4-3)
TM 11-5805-243-12, Telephone Set TA-1/PT, C3-5, Sep 59 (pages 11 thru 14)
TM 38-750, The Army Maintenance Management System (TAMMS), C1, Nov 72 (chap 3, pages 3-4 thru 3-7, para 3-4)
TEC Lesson 936-061-0125-F, Field Wire Installation; Equipment
TEC Lesson 936-061-0129-F, Field Wire Installation; Maintenance and Troubleshooting
TEC Lesson 936-061-0137-F, Local Battery Operation

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TASK NUMBER: 113-600-1001

INSTALL TELEPHONE SET (TA-312/PT OR TA-1/PT)

CONDITIONS:

Situation 1: Given a working telephone set TA-1/PT, pliers TL-13A, an installed wire line WD-1/TT, and a telephone or switchboard with an operator at the far end of the wire line.

Situation 2: Given a working telephone set, TA-312/PT, two BA-30 batteries, pliers TL-13A, an installed wire line WD-1/TT, and a telephone or switchboard with an operator at the far end of the wire line.

STANDARDS:

Install either field telephone IAW the performance measures below.

PERFORMANCE MEASURES:

1. **Installing the telephone set TA-1/PT:**

a. Using pliers TL-13A, strip ½-inch of insulation from each strand of the wire line.

b. Refer to figure 1. Depress the spring-loaded line binding posts and insert one strand into each post.

c. Adjust signal volume control knob to LOUD.

d. Depress the generator lever several times to call the other operator and ask for a buzzer signal.

e. When the buzzer sounds, turn the buzzer volume control knob until desired volume is obtained, then look at the visual indicator to see if it shows four white luminous markings.

f. To talk, depress the push-to-talk switch; release it to receive.

g. As a field expedient, the receiver can be used for both transmitting and receiving.

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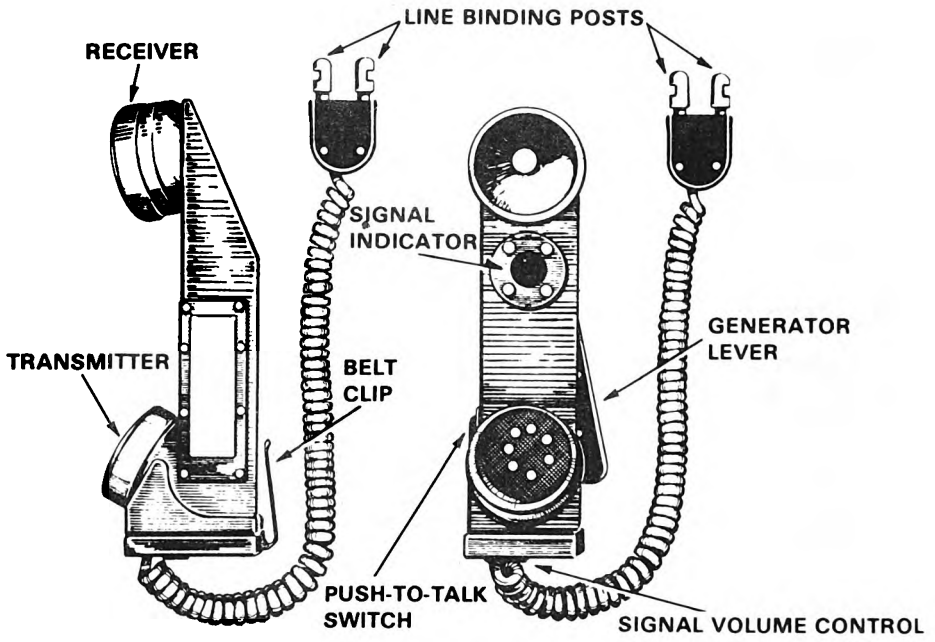

Figure 1.

2. **Installing the telephone set TA-312/PT:**

a. Using pliers TL-13A, strip ¼-inch of insulation from each strand of the wire line.

b. Refer to figure 2. Depress the spring-loaded line binding posts and insert one strand into each post.

c. Adjust buzzer volume control knob to LOUD.

d. Place the INT-EXT switch to INT.

e. Place the circuit selector switch to LB.

f. Insert the BA-30 batteries into the battery compartment, one up and one down.

g. Be sure the handset is seated firmly in the retaining cradle.

h. Turn the handcrank rapidly a few turns.

i. Remove the handset from the retaining cradle and wait for the operator to answer.

j. Depress the push-to-talk switch to talk, and release it to listen.

k. Request the other operator to give you a ring back.

l. When the buzzer rings, terminate the call and place the handset in the retaining cradle.

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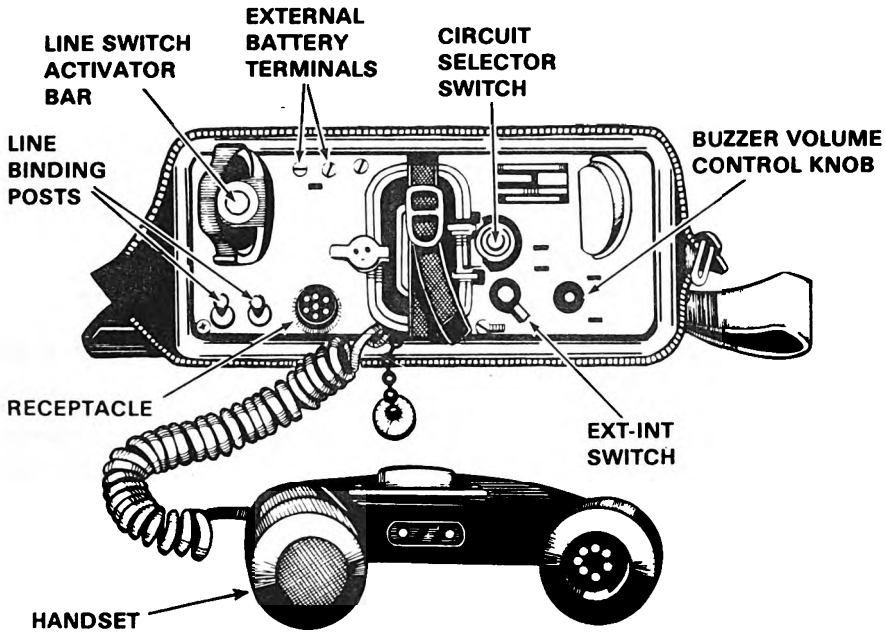

Figure 2.

REFERENCES:

TM 11-5805-201-12, Telephone Set TA-312/PT, C1, 2, Jan 67 (chap 2, page 2-1 thru 2-8, para 2-1 thru 2-5)
TM 11-5805-243-12, Telephone Set TA-1/PT, C3-5, Sep 59 (chap 2, page 6, para 9-12)
TEC Lesson 936-061-0137-F, Local Battery Operation

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TASK NUMBER: 113-587-3005

PERFORM OPERATOR MAINTENANCE ON RADIO SETS; AN/PRC-77 OR AN/VRC-64

CONDITIONS:

You are participating in a field exercise or performing required garrison maintenance. Given either radio set (AN/PRC-77 or AN/VRC-64), prepared for operation, the appropriate TM, clean cloth, trichloroethylene, mild soapy water, flat tip screwdriver, a radio station within range, callsigns, a frequency, a blank DA Form 2404, and TM 38-750.

STANDARDS:

1. Perform all prescribed operator maintenance steps as required by the appropriate TM.

2. Complete DA Form 2404 IAW TM 38-750, para 3-4.

PERFORMANCE MEASURES:

1. Perform all prescribed operator maintenance steps for the AN/PRC-77 IAW TM 11-5820-667-12, chap 4, pages 4-1 thru 4-3, para 4-1 thru 4-8.

2. Perform all prescribed operator maintenance steps for the AN/VRC-64 IAW TM 11-5820-498-12, chap 4, pages 4-1 thru 4-12, para 4-1 thru 4-11.

3. Previously reported faults beyond the operator's capability to repair or those requiring parts are recorded on the Uncorrected Fault Record (DA Form 2408) in the logbook. This form is completed by organizational maintenance IAW procedures outlined in paragraph 4-13 of TM 38-750.

4. Faults which the operator cannot correct or which require a part are recorded on DA Form 2408 IAW procedures outlined in paragraph 3-4 of TM 38-750.

REFERENCES:

TM 38-750, Army Maintenance Management System (TAMMS), C1, Nov 72 (chap 3, page 3 thru 4, para 3-4)
TM 11-5820-498-12, Radio Sets AN/VRC-64 and AN/GRC-160, C5, May 67 (chap 4, pages 4-1 thru 4-12, para 4-1 thru 4-11)
TM 11-5820-667-12, Radio Set AN/PRC-77, C1 thru 4, Jun 67, (chap 4, pages 4-1 thru 4-3, para 4-1 thru 4-8)
TEC Lesson 201-113-4501-F, Preparation of Radio Set AN/PRC-77 for Operation Part 1: Installation

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TASK NUMBER: 113-587-2001

OPERATE RADIO SET AN/PRC-77 OR AN/PRC-25

CONDITIONS:

Given a functional radio set (AN/PRC-77 or AN/PRC-25) with all parts, a frequency, callsigns, another station within range (can be another radio operator requiring training), knowledge of how to make a radio check, and battery BA-4386. Entering a radio net is not required in this task.

STANDARDS:

Within 2 minutes, assemble the AN/PRC-77 or AN/PRC-25 and make a communication check with the other station.

PERFORMANCE MEASURES:

1. **Assembly of radio set AN/PRC-77** (figure 1) (TM 11-5820-667-12, chap 1, pages 1-2 thru 1-5). Inspect radio set to insure that all components are present:

a. Electrical harness.

b. Antenna, AT-892/PRC-25.

c. Antenna, AT-271/A PRC.

d. Antenna support.

e. Handset.

f. Cotton-duck bag.

g. Receiver-transmitter, RT-841.

h. Battery BA-4386.

2. **Installation of battery** (figure 2) (TM 11-5820-667-12, chap 2, page 2-4, para 2-4).

a. Place radio on control guard, and remove battery box.

b. Do not install battery (BA-4386) until you are certain air vent in battery box works.

(1) Depress valve and blow from the outside; air should pass through the vent.

(2) Release the valve and blow; air should not flow.

c. Check pressure relief valve before installing battery.

d. Place battery in battery box as shown in figure 2.

CAUTION: Do not break floating connector.

e. Replace battery box and close both latches at the same time.

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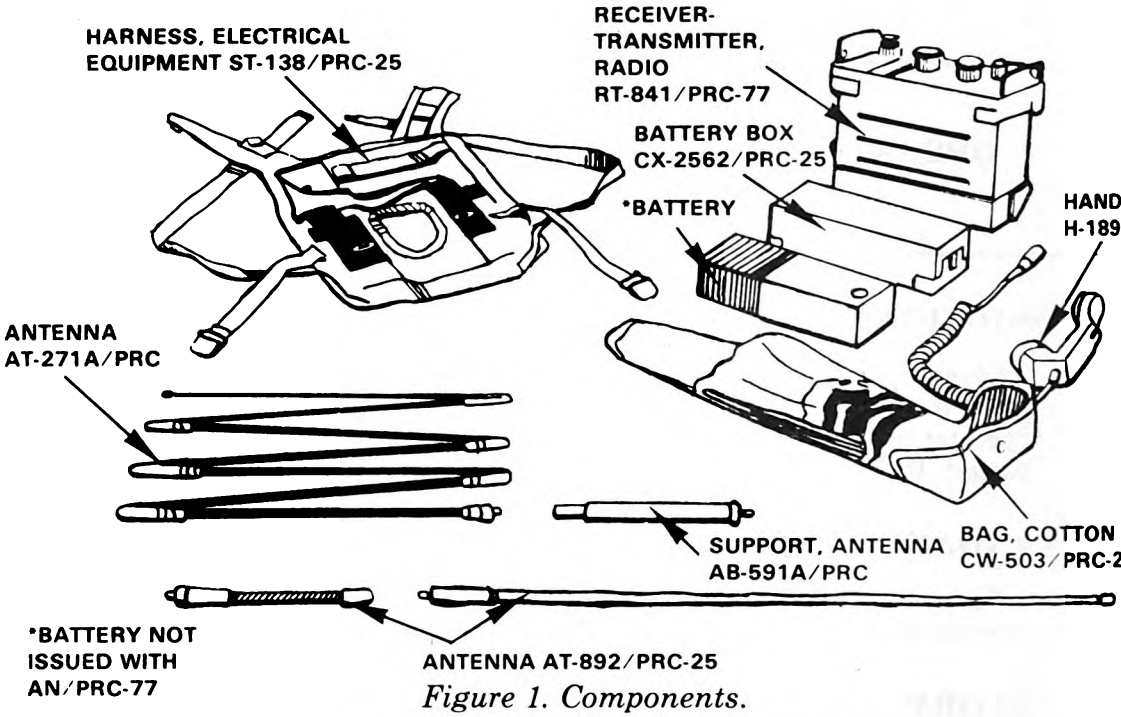

Figure 1. Components.

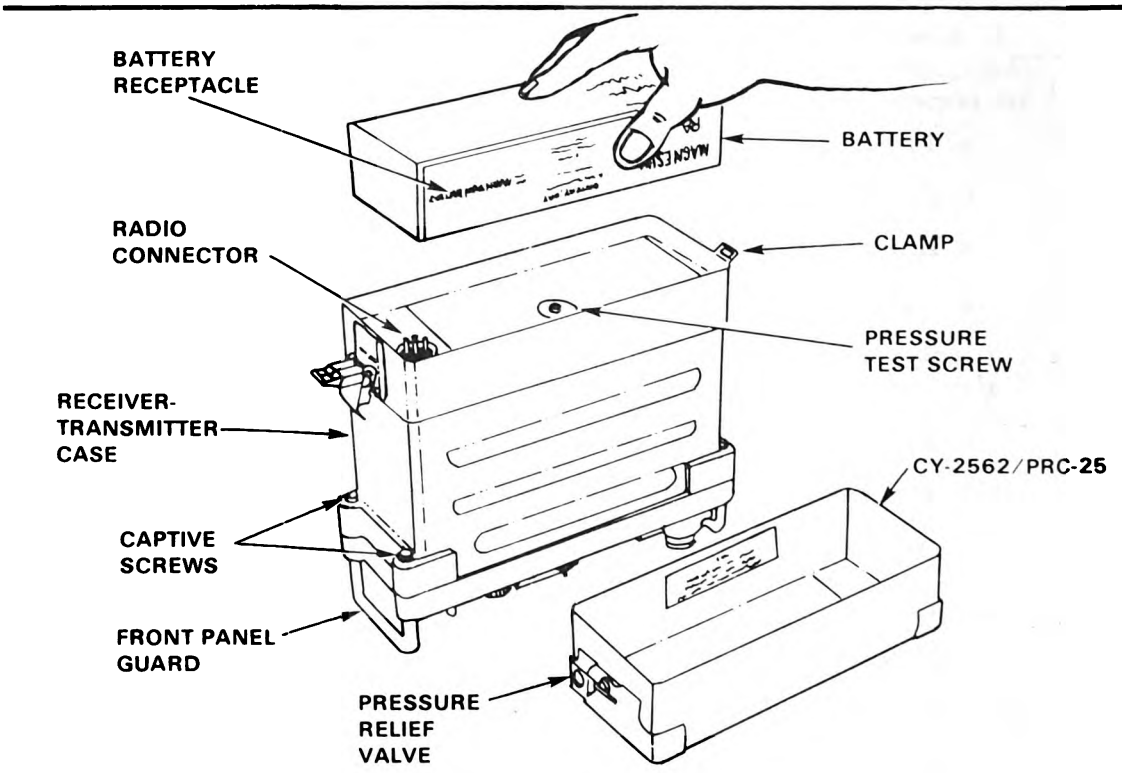

Figure 2. Installing battery in receiver-transmitter.

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3. **To operate set** (figure 3) (TM 11-5820-667-12, chap 3, pages 3-1 thru 3-7).

a. The numbers of steps 1 through 6 below relate to the numbers in figure 3.

(1) Install the antenna required for the type of operation in the antenna mount.

(2) Attach handset H-189/GR to either audio connector.

(3) Turn the function switch to on.

(4) Turn the band switch to the desired operating frequency band.

(5) Turn the MC tuning and KC tuning control knobs until desired frequency appears in the channel dial (7).

(6) Turn the volume control to 4.

(7) Press the handset H-189/GR push-to-talk switch and speak into handset; release the push-to-talk switch to listen.

(8) Adjust the volume control (6) for a desirable sound level.

(9) To reduce the rushing noise when no signal is being received, turn switch (3) to squelch.

b. Make a radio check with other stations.

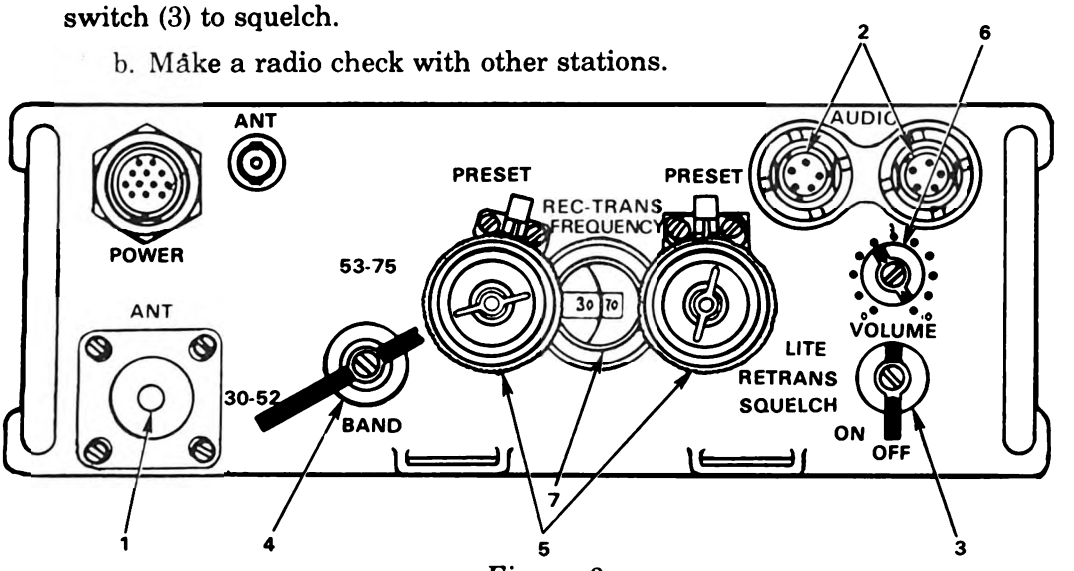

Figure 3.

c. To turn set off: Turn the function switch (3) to off.

REFERENCES:

TM 11-5820-667-12, Radio Set AN/PRC-77, Jun 67
TEC Lesson 201-113-4501-F, Preparation of Radio Set, AN/PRC 77 for OP PT 1, Install
TEC Lesson 201-113-4502-F, Preparation of Radio Set, AN/PRC-77 for OP PT 2, Operation Checks
TEC Lesson 201-113-4503-F, Preparation of Radio Set, AN/PRC-77 for OP PT 3, Pre-Sets

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TASK NUMBER: 113-587-2002

PREPARE RADIO SET AN/VRC-64 FOR OPERATION

CONDITIONS:

Given the functional components for the AN/VRC-64 radio, a tactical vehicle with mount MT-1029/VRC and antenna matching unit base installed in operational condition, antenna AS-1729/VRC or antenna AT-912/VRC, a frequency, callsigns, a radio station within range (can be another radio operator performing the task), a knowledge of how to make a radio check, TM 11-5820-498-12, and radio cables necessary to install the radio set. Entering a radio net is not required to perform this task.

STANDARDS:

1. Within 15 minutes, install and assemble the radio.

2. Within 10 minutes, place the radio into operation and make a communication check.

PERFORMANCE MEASURES:

WARNING: operator must be familiar with the requirements of TB SIG 291 before attempting installation or operation of the equipment covered in this task. Failure to follow requirements of TB SIG 291 could result in injury or DEATH.

1. **Installation of radio set AN/VRC-64** (figures 1 thru 4) (TM 11-5820-498-12, chap 2, pages 2-1 thru 2-7).

a. Inspect radio set to insure that all components are present:

(1) Amplifier-power supply OA-3633/GRC (figure 1).

(2) Mounting MT-1029/VRC (figure 2).

(3) Receiver-transmitter RT-871/PPC-77 (figure 3).

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b. Observe the precaution on warning label, DA Label 132: **"WARNING: DO NOT START VEHICLE WHILE RADIO IS ON."** The label, positioned in attention-arresting location is required by SB11-624.

WARNING: Do not permit manpack or vehicular whip antennas to touch high powerlines or other sources of electricity; injury or death could result. Observe the requirements of TB SIG 291 which illustrates the danger of permitting an antenna to contact other sources of power.

CAUTIONS:

1. **Remove battery from battery box when the receiver- transmitter is installed in a vehicle.**

2. **DO NOT OPERATE the radio within 3 megacycles of the operating frequency of another radio that is less than 25 feet away. Mutual interference can occur.**

3. **DO NOT REVERSE the connections of the radio power cable leads at the vehicle battery. Damage to resistors and diodes may result if the leads are reversed at the battery terminals.**

4. **DO NOT KEY the receiver-transmitter (by operating the handset push-to-talk switch or holding the audio accessory switch at RADIO position) while changing channels or the BAND switch. Module damage may occur or the frequency of the new channel may be incorrect.**

5. **DO NOT START THE VEHICLE ENGINE, restart it, slave-start, or stop it with the radio turned on. The OA-3633/GRC PWR switch must be set to OFF and, if used, the AM-1780/VRC MAIN PWR switch must also be set to OFF.**

2. **Installation of Amplifier-Power Supply on Mounting MT-1029/VRC** (figures 1 thru 3).

a. Loosen the clamps on the MT-1029/VRC.

b. Set the amplifier-power supply (AM-2060/GRC) on the MT-1029/VRC.

c. Mate the POWER INPUT connector at the rear of the amplifier-power supply with the connector on the MT-1029/VRC junction box. Be sure that the guide pins on the MT-1029/VRC are alined with the guide pinholes on the amplifier-power supply.

d. Push the amplifier-power supply back on the MT-1029/VRC.

e. Engage the clamps on the MT-1029/VRC with the clamp recess on the amplifier-power supply. Tighten the clamps securely.

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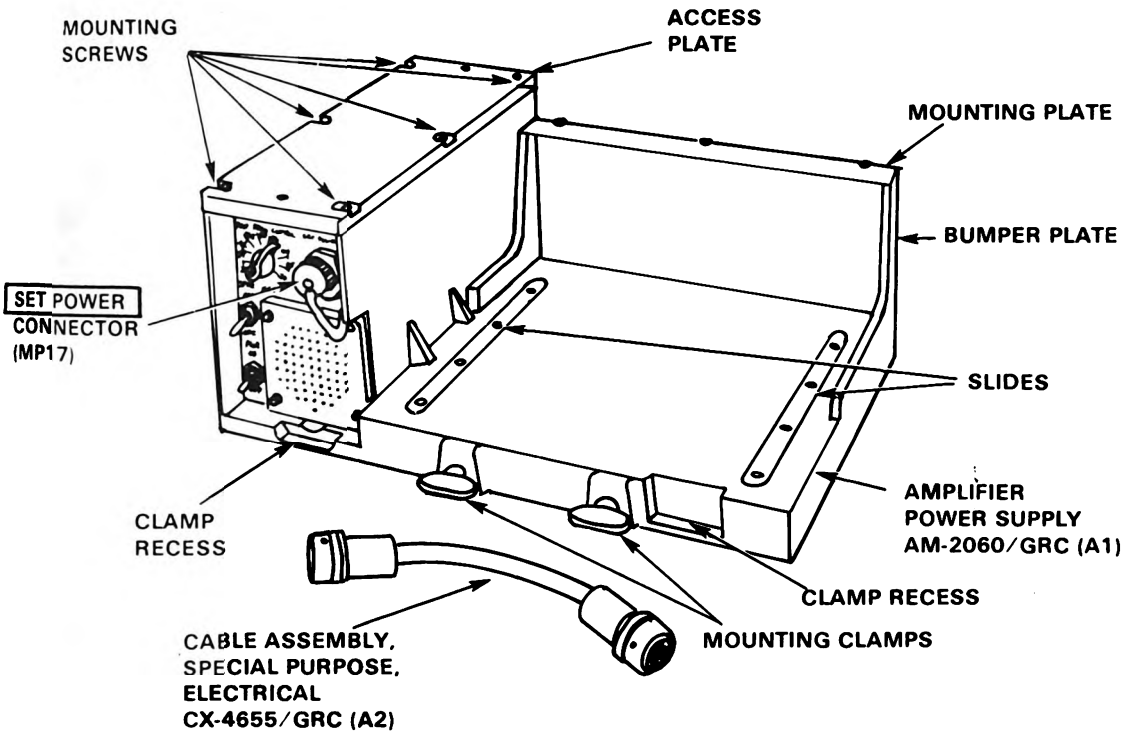
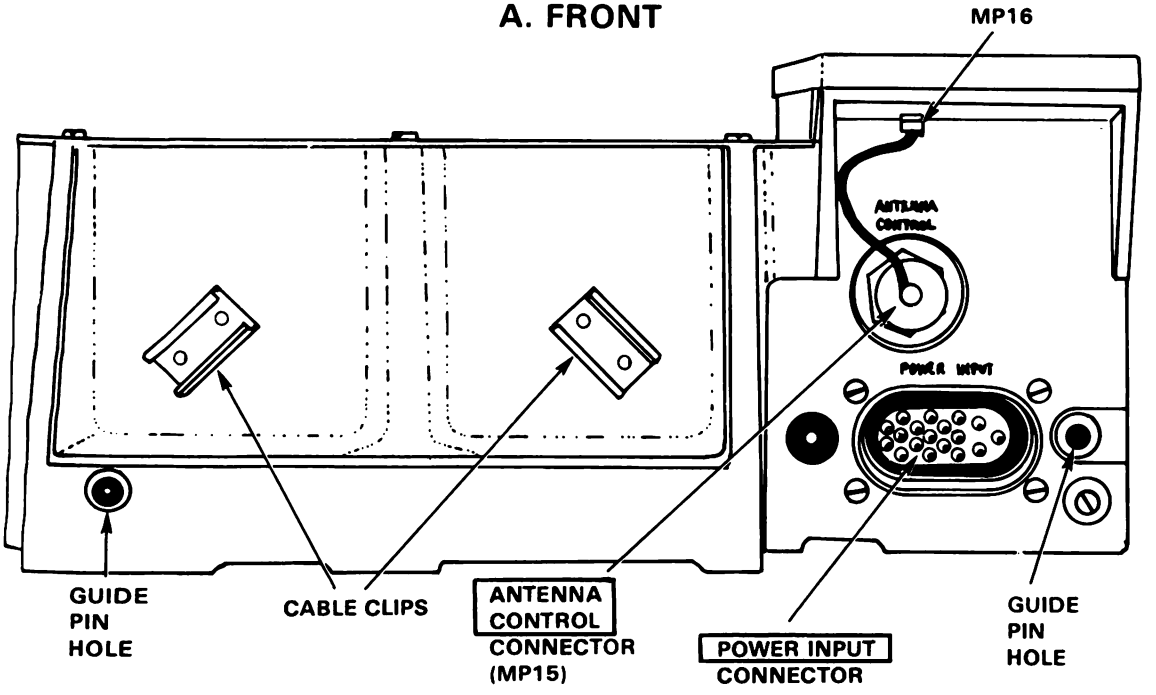


A. FRONT



B. REAR

Figure 1. Amplifier-power supply OA-3633/GRC.

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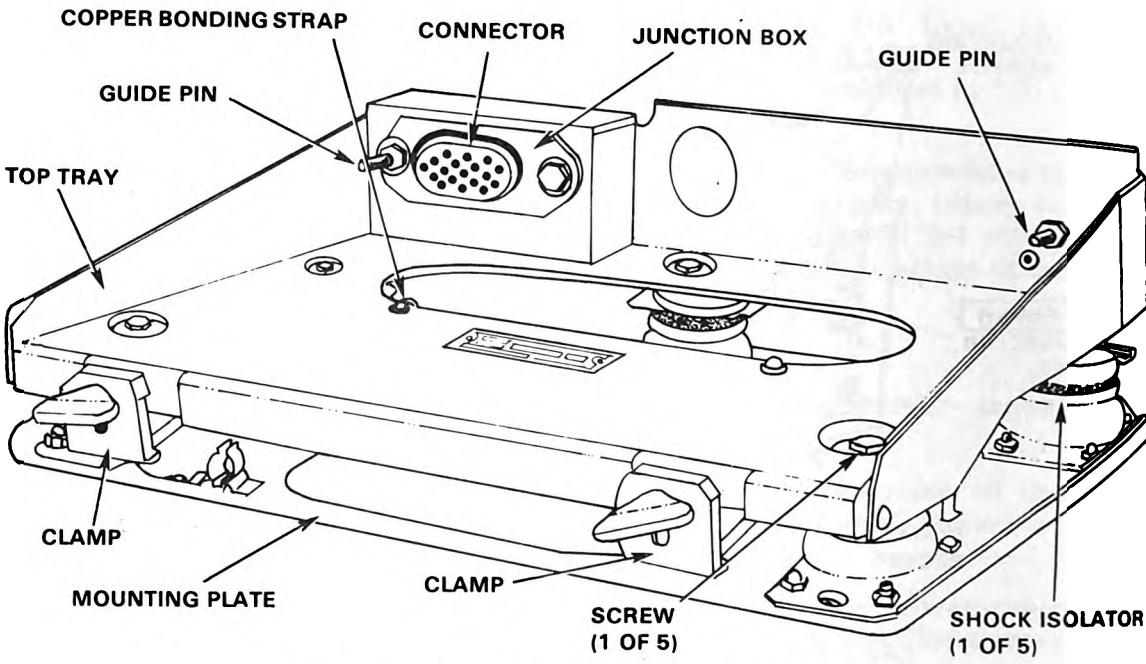

Figure 2. Mounting MT-1029/VRC.

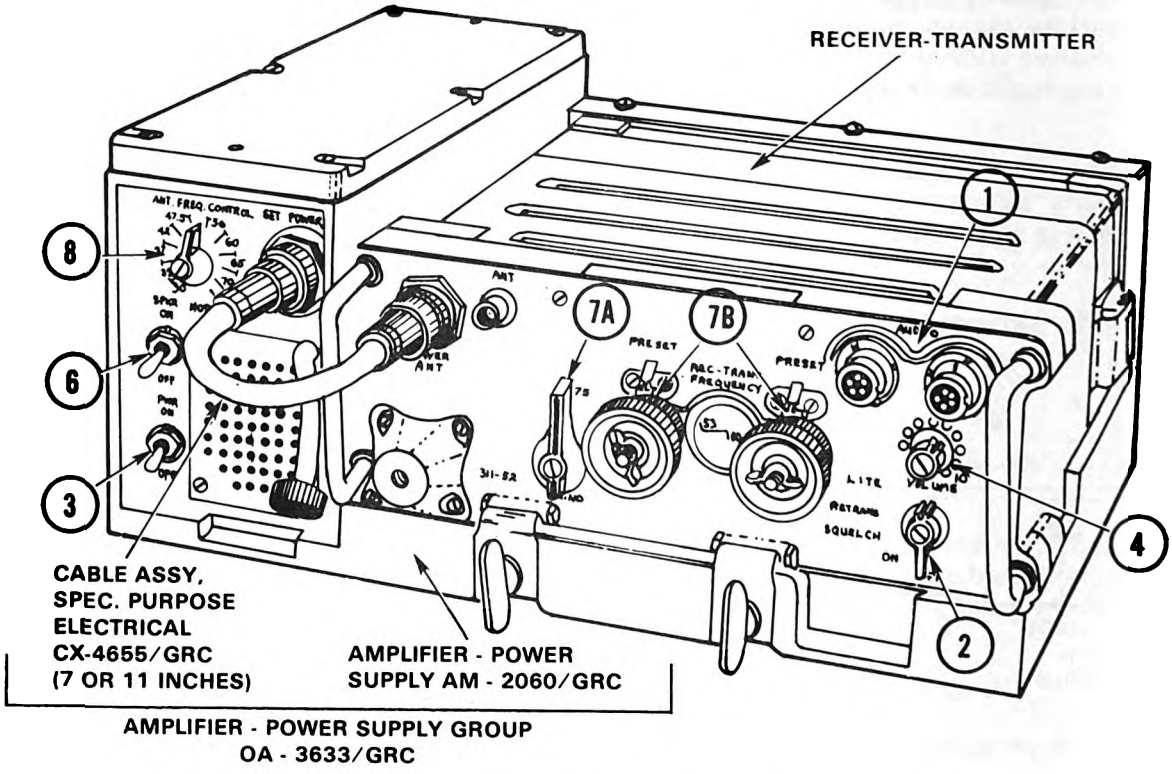

Figure 3. Amplifier-power supply group OA-3633/GRC or OA-3633A/GRC with receiver-transmitter installed.

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f. Connect the cable assembly (Special Purpose, Electrical CX-4722/VRC) between the amplifier-power supply ANTENNA CONTROL connector and connector J552 on Antenna Matching Unit MX-2799/VRC, or connector J2 on Antenna Matching Unit MX-6707/VRC (figure 4).

NOTE: The ANTENNA CONTROL connector on the back of the amplifier-power supply (figure 1) is female, and the one on the AT-912/VRC or AS-1729/VRC has male pins. Connect the corresponding mating end of the CX-4722/VRC accordingly.

CAUTION: Be careful when connecting the CX-4722/VRC connectors to the mating connectors. Improper mating damages the pins of the cable connector, or pins in the antenna matching units. First, line up the key in the receptacle with the slot in the cable connector; then press in on the cable connector and turn the cable connector sleeve to lock the cable connector to the receptacle.

3. **Installation of receiver-transmitter on amplifier-power supply** (figures 1 and 3).

NOTE: Only if immediate man-pack operation is expected during the mission, install the battery in the receiver-transmitter before installing the receiver-transmitter on the amplifier-power supply.

a. Loosen the screw-type mounting clamps on the front of the amplifier-power supply; they will drop slightly.

b. Slide the receiver-transmitter into the amplifier-power supply until the bottom of the receiver-transmitter is flush with the bumper plate at the rear of the amplifier-power supply.

c. Raise the screw-type mounting clamps until they engage the lips on the panel of the receiver-transmitter; tighten the screw-type mounting clamps.

d. Remove the protective cap from the POWER connector on the panel of the receiver-transmitter.

e. Connect cable assembly (Special Purpose, Electrical CX-4655/GRC) between the amplifier-power supply SET POWER connector and the receiver-transmitter POWER connector (figure 3).

f. Connect cable assembly (Radio Frequency CG-1773/U) between the receiver-transmitter ANT connector and connector J551 and the MX-2799/VRC or connector J1 on the MX-6707/VRC (figure 4).

4. **Operation of set** (figure 3) (TM 11-5820-498-12, chap 3, page 31-2, para 3-14). (The numbers within steps below relate to the numbers in figure 3.)

WARNING: Dangerous voltage exists at the antenna. Be careful not to touch the antenna while the radio set is transmitting.

a. Connect the handset or microphone to either of the two receiver-transmitter (1) AUDIO connectors.

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b. Turn the receiver-transmitter (2) FUNCTION switch to ON.

c. Turn the amplifier-power supply (3) PWR switch to ON.

d. Adjust the receiver-transmitter (4) VOLUME control until background noise is heard.

e. If squelch operation (2) is to be used, refer to TM 11-5820-498-12, paragraph 3-12a, b, and c, for squelch operation conditions and perform the procedures given in 12d to use the squelch feature.

f. If the amplifier-power supply loudspeaker is to be used, proceed as follows:

(1) Set the (6) SPKR switch to ON.

(2) Adjust the receiver-transmitter VOLUME control to a desired listening level.

g. Tune the receiver-transmitter as follows:

(1) Turn the (7A) BAND switch to 30-52 or 53-75, depending on the frequency band desired.

(2) Turn the MHz tuning and KHz tuning controls (7B) until the operating frequency appears on the channel dial.

h. Turn the OA-3633/GRC ANT (8) FREQ CONTROL to the position that includes the selected operating frequency.

CAUTION: If the H-138(*)/U is used (i below), do not speak into both microphone elements. The H-138(*)/U has two microphone elements for noise cancellation; speaking into both elements at the same time will cancel out your voice.

i. To transmit, press the handset push-to-talk switch and speak into one microphone element; to receive, release the switch.

j. To turn the radio set off:

(1) Set the OA-3633/GRC PWR switch to OFF.

(2) Turn the receiver-transmitter FUNCTION switch to OFF.

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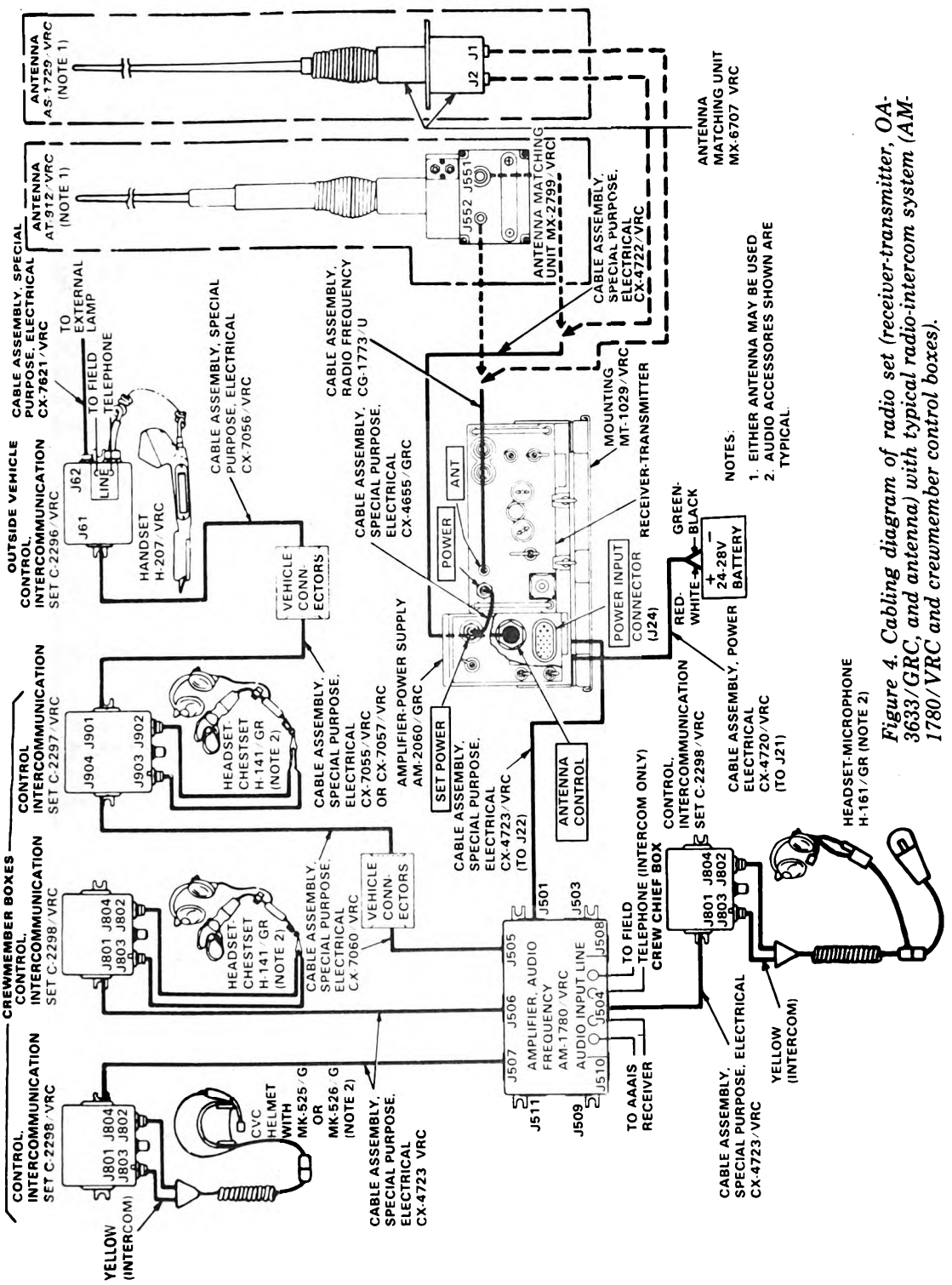
ANTENNA AS-1729/VRC (NOTE 1)
ANTENNA AT-912/VRC (NOTE 1)
ANTENNA MATCHING UNIT MX-2799/VRC
ANTENNA MATCHING UNIT MX-6707 VRC
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4722/VRC
CABLE ASSEMBLY, RADIO FREQUENCY CG-1773/U
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4655/GRC
MOUNTING MT-1029/VRC
RECEIVER-TRANSMITTER
POWER INPUT CONNECTOR (J24)
RED-WHITE
GREEN-BLACK
24-28V BATTERY
NOTES.
1. EITHER ANTENNA MAY BE USED
2. AUDIO ACCESSORES SHOWN ARE TYPICAL
OUTSIDE VEHICLE CONTROL, INTERCOMMUNICATION SET C-2296/VRC
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-7621/VRC
TO EXTERNAL LAMP
TO FIELD TELEPHONE
HANDSET H-207/VRC
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-7056/VRC
VEHICLE CONNECTORS
CREWMEMBER BOXES
CONTROL, INTERCOMMUNICATION SET C-2297/VRC
CONTROL INTERCOMMUNICATION SET C-2298/VRC
HEADSET-CHESTSET H-141/GR (NOTE 2)
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-7055/VRC OR CX-7057/VRC
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-7060/VRC
AMPLIFIER-POWER SUPPLY AM-2060/GRC
SET POWER
POWER
ANT
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4723/VRC (TO J22)
ANTENNA CONTROL
AMPLIFIER, AUDIO FREQUENCY AM-1780/VRC
AUDIO INPUT LINE
TO FIELD TELEPHONE (INTERCOM ONLY) CREW CHIEF BOX
TO AAAIS RECEIVER
CONTROL, INTERCOMMUNICATION SET C-2298/VRC
CABLE ASSEMBLY, POWER ELECTRICAL CX-4720/VRC (TO J21)
HEADSET-MICROPHONE H-161/GR (NOTE 2)
CVC HELMET WITH MK-525/G OR MK-526/G (NOTE 2)
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4723/VRC
YELLOW (INTERCOM)
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4723/VRC
YELLOW (INTERCOM)

Figure 4. Cabling diagram of radio set (receiver-transmitter, OA-3633/GRC, and antenna) with typical radio-intercom system (AM-1780/VRC and crewmember control boxes).

REFERENCE:

TM 11-5820-498-12, C1 thru C5, May 67 (chap 2, pages 2-1 thru 2-7; chap 3, page 3-12 para 3-14)

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TASK NUMBER: 113-587-3004

PERFORM OPERATOR MAINTENANCE ON RADIO SET AN/VRC-46 OR AN/VRC-47

CONDITIONS:

You are participating in a field training exercise or performing required garrison maintenance. Given an installed operational FM radio (vehicular mounted) the appropriate TM, clean cloth, trichloroethylene, mild soapy water, flat tip screwdriver, a radio station within range, callsigns, a frequency, a blank DA Form 2404 and TM 38-750.

STANDARDS:

1. Perform all prescribed operator maintenance steps as required by the appropriate TM.

2. Complete DA Form 2404 IAW TM 38-750, paragraph 3-4.

PERFORMANCE MEASURES:

1. Perform all prescribed operator maintenance steps outlined in the preventive maintenance services section of TM 11-5820-401-12, chap 4, para 4-1 thru 4-3.

2. To correct deficiencies/shortcomings, refer to TM 11-5820-401-12, chap 4, para 4-4 thru 4-6.

3. Previously reported faults beyond the operator's capability to repair or those requiring parts are recorded on the Uncorrected Fault Record (DA Form 2408-14) in the logbook. This form is completed by organizational maintenance.

4. Faults which the operator cannot correct or which require a part are recorded on DA Form 2408 IAW procedures outlined in paragraph 3-4 of TM 38-750.

REFERENCES:

TM 38-750, Army Maintenance Management System (TAMMS), C1, Nov 72 (chap 3, page 3 thru 4, para 3-4)
TM 11-5820-401-12, Radio Sets AN/VRC-46 and AN/VRC-47, Sep 72 (chap 4, para 4-1 thru 4-3)
TEC Lesson 936-061-0117-F, Tactical FM Radio: RT524A and R442: Maintenance

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TASK NUMBER: 113-587-2020

PREPARE TACTICAL FM RADIOS (AN/VRC-46 OR AN/VRC-47) FOR OPERATION

CONDITIONS:

Given the functional components for the AN/VRC-47 or AN/VRC-46 radio, a tactical vehicle with radio mounts, antenna matching unit, and cable assembly installed in operational condition, a frequency, callsigns, a radio station within range (can be another radio operator performing the task), a knowledge of how to make a radio check; and TM 11-5820-401-12. Entering a radio net is not required to perform this task.

STANDARDS:

1. Install, assemble, and disassemble radios IAW chapter 2, TM 11-5820-401-12.

2. Place the applicable radio (receiver-transmitter) into operation and make a communication check IAW performance measures below:

PERFORMANCE MEASURES:

1. **Radio set AN/VRC-46.**

a. Inspect radio set to insure that all components are present:

(1) Receiver - transmitter (figure 1).

(2) Antenna AT-912/VRC (figure 2).

(3) Mountings MT-1029/VRC and MT-1898/VRC (figure 3).

(4) Cables (figure 4).

(5) Antenna AS-1729 (figure 5).

b. Installing, assembling, disassembling, and handling radio equipment: Refer to TM 11-5820-401-12, chapter 2.

2. **To operate receiver-transmitter RT-524/VRC** (figure 1).

CAUTION: DO NOT turn radio on until vehicle is started or the set may be damaged.

a. Start the vehicle.

b. The numbers within the steps below are keyed to the numbers in figure 1.

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(1) Set POWER switch (1) to LOW power position.

(2) Set LIGHT switch (2) to ON position.

(3) Set SQUELCH switch (3) to desired mode of operation (NEW - ON position).

(4) Set BAND switch (4) to position of given operating frequency (A-Band).

(5) Turn MHz control (5) to desired frequency.

(6) Turn KHz control (6) to desired frequency.

(7) Turn SPEAKER control (7) to ON.

(8) Turn VOLUME control (8) to desired listening level.

c. Make a radio check with the squelch switch (3) OFF.

d. Turn BAND switch (4) to B-Band.

e. Turn MHz and KHz controls (5 and 6) to desired frequency.

f. Make a radio check with the SQUELCH switch (3) ON.

g. Turn POWER switch to OFF before you stop vehicle motor.

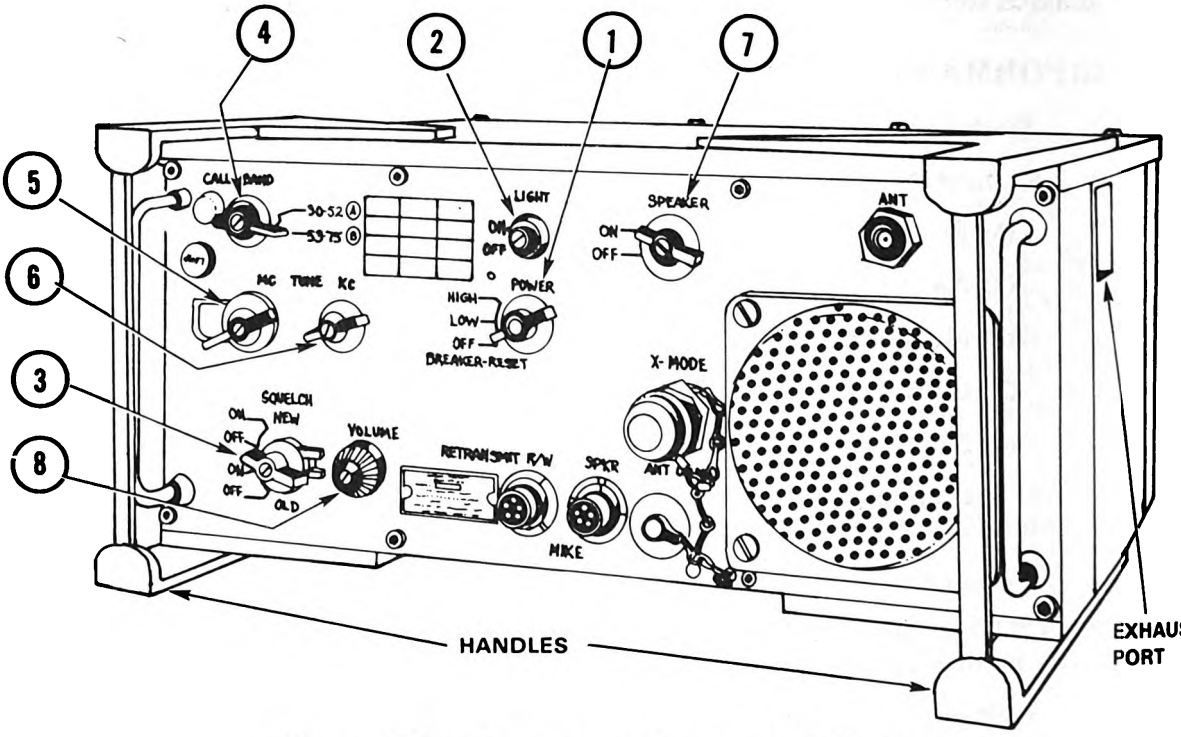

Figure 1. Receiver-transmitter, radio RT-524/VRC.

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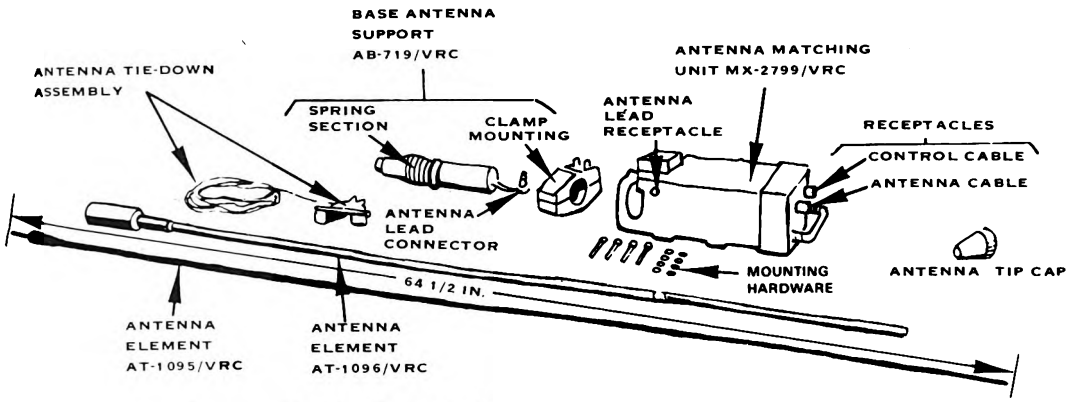
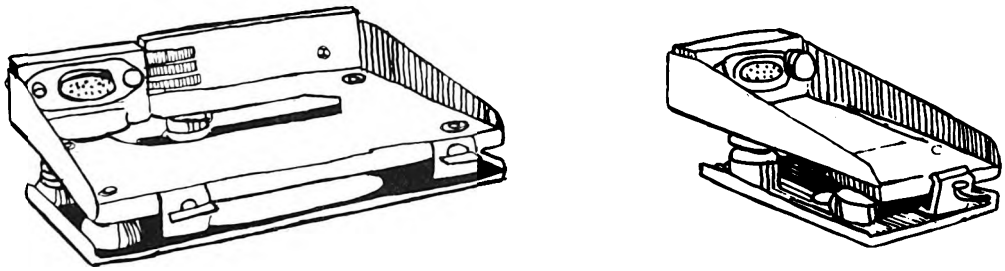


Figure 2. Antenna AT-912/VRC, disassembled.



A. MOUNTING MT–1029/VRC (FOR RECEIVER–TRANSMITTERS).

B. MOUNTING MT–1898/VRC (FOR R–442(*)/VRC.

Figure 3. Mountings MT-1029/VRC and MT-1898/VRC.

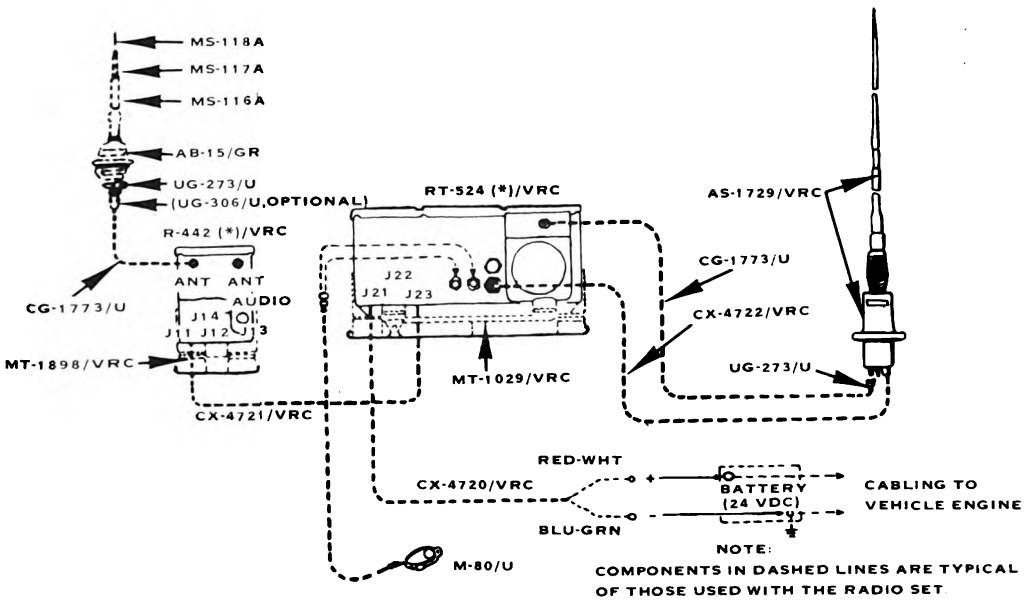


Figure 4. Typical cabling diagram for AN/VRC-47.

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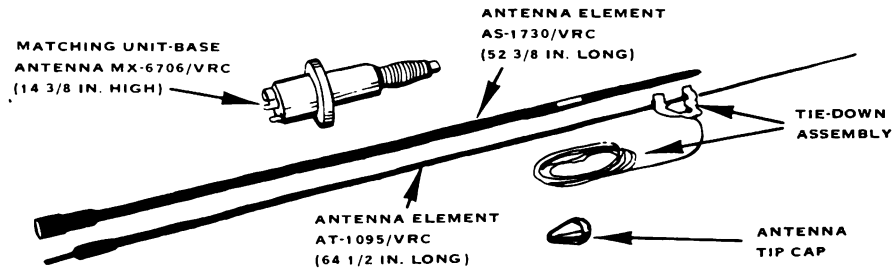

Figure 5. Antenna AS-1729/VRC, disassembled.

3. **To operate AN/VRC-47** (figures 1 thru 6).

CAUTION: DO NOT turn radio on until vehicle is started or the set may be damaged.

a. Operation of the RT-524 and R-442 together forms the AN/VRC-47. A check of the R-442 operation should be done in conjunction with checking the RT-524.

b. To operate the receiver-transmitter 524 (figure 1), refer to paragraphs 1 and 2 above.

c. The numbers within steps below are keyed to the numbers in figure 6.

(1) Turn POWER switch (1) to ON.

(2) Turn BAND switch (2) to A.

(3) Turn MHz control (3) to desired frequency.

(4) Turn KHz control (4) to desired frequency.

(5) Turn VOLUME switch (5) to desired listening level.

NOTE: There is no speaker control switch on the R-442. An external speaker is required (loudspeaker LS-454/U) (figure 7).

(6) Receive message from another station with SQUELCH (6) ON.

(7) Turn BAND switch (2) to B position.

(a) Turn MHz and KHz controls (3 and 4) to desired frequency.

(b) Receive message from another station.

(8) Turn POWER switch (1) to OFF before you stop vehicle motor.

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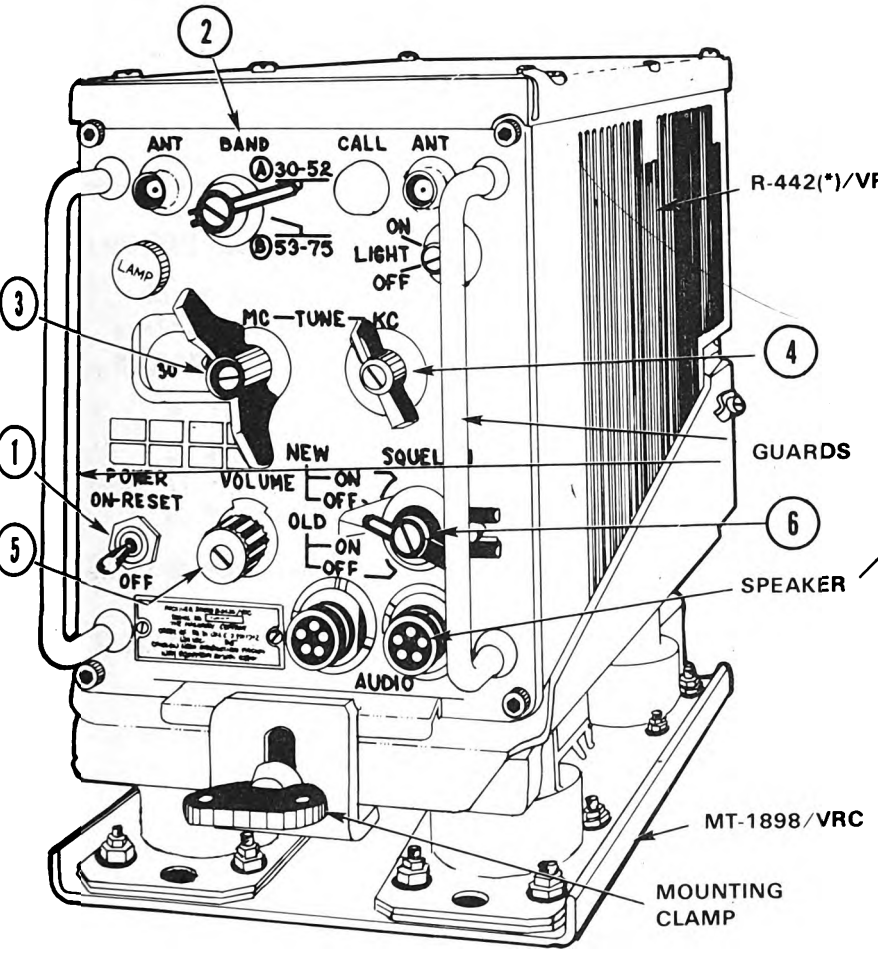

Figure 6. Receiver R-442(*)/VRC, installed on Mounting MT-1898/VRC.

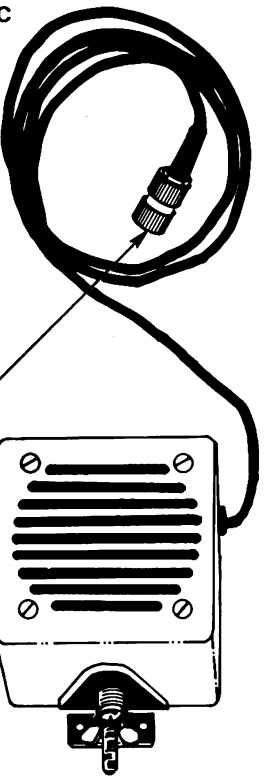

Figure 7. Loudspeaker LS-454/U.

REFERENCES:

TM 11-5820-401-12, Radio Sets AN/VRC-46 and AN/VRC-47, C1, Aug 72 (pages 2-3 thru 2-20, para 2-5 thru 2-11; pages 3-1 thru 3-8, para 3-2 thru 3-7; pages 3-15 thru 3-24, para 3-14 thru 3-17; page 3-26, para 3-19)

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TASK NUMBER: 113-573-8001

USE AN AUTOMATED CEOI

CONDITIONS:

Given an extract of the division Communications-Electronics Operating Instructions (CEOI) and directions to determine, for a specified time period, any or all of the following:

a. The frequency(s) of specified unit nets.

b. The callsign(s) of station(s) within a given net.

c. Your own item number identifier.

d. Another station's identity, given its item number identifier.

STANDARDS:

1. Within 2 minutes (for each station), determine the complete individual callsign (to include suffix) assigned by the CEOI to that station, for the time period specified, and state (or show) it to your supervisor.

2. Within 1 minute (for each net), determine the frequency assigned by the CEOI to that unit, for the time period specified, and state (or show) it to your supervisor.

3. Within 2 minutes, determine your own item number identifier as given in the CEOI for the time period specified.

4. Within 2 minutes, determine an unknown station's unit identity.

PERFORMANCE MEASURES:

1. **General:**

a. The CEOI contains specific instructions for the operation of communication systems under a division headquarters — and is the only authorized document from which subordinate elements will extract information to compile organization/unit CEOIs — for use during tactical training and contingency operations.

b. Callsigns, suffixes, and frequencies will be changed simultaneously during each time period throughout the division. Specific callsign and frequency assignments will not be transmitted in the clear over nonsecure means of communication. If such transmission is required, the callsign and frequency must be encoded using the current tactical unit operations code or

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numeral/cipher authentication system. All information is listed according to time periods. When determining callsigns and frequencies, be sure you look under the correct time period. [Your supervisor can explain the local time period designation procedure that you should use.]

2. **To determine callsigns:** To find the callsigns for a given element (for example: 1/77 Inf, A Co, 1st Plt Ldr), turn to the index (figure 1a) of the CEOI. Follow the left-hand column of items until you find the parent unit (e.g., 1/77 INF BN). Next, look across from the parent unit to the right-hand column under the item number heading to find the correct item number (6A) and turn to that item number (figure 2a). Determine the correct time period (01) and look down the column headed by that time period to find the callsign for 1/77 Inf, A Co, 1st Plt (J1M). Then, go back to the index (figure 1a) and find the item number for suffixes (item no. 2). Turning to that item number (figure 3), find PLT LDR. Located to the left of PLT LDR is its two-digit suffix (13). Combining the callsign (J1M) with the suffix (13) gives you the complete five-character callsign for the Plt Ldr, 1st Plt, A Co, 1/77 Inf Bn (J1M13).

3. **To determine frequencies:** Frequencies are assigned to each unit according to command echelon. To find the frequency for a given net (for example: 1/77 Inf, A Co, 1st Plt), turn to the index (figure 1a) and find the parent organization item number, as in para 2 above. Turn to that item number (figure 2b) and look down the left-hand column until you find the unit you want to communicate with (A Co, 1st Plt). After finding the unit, look to the right under the correct time period (01) to find the right frequency (52.45).

4. **Item number identifiers.** Unknown station callsigns can be identified by the use of item number identifiers. Each station should know the two-letter identifier for its own net for each time period. To find your item number identifier, follow these steps:

Step 1 - Go to the index of your CEOI and find item numbers for both your unit and ITEM NUMBER IDENTIFIERS.

Step 2 - Turn to the correct item number for ITEM NUMBER IDENTIFIERS and read down the column under the appropriate time period until you find your unit's CEOI item number. Next, follow that line to the far left column to find your correct two-letter ITEM NUMBER IDENTIFIER. Use this number to identify yourself when entering a net in which you do not normally operate. This gives the other net your CEOI item number from which your station's identity can readily be determined.

Example:

You have just received a call from a unknown station. The individual identified himself using the callsign S9A17 and stated that his item number identifier is AB. The time period is 01, and the individual authenticated correctly when you challenged him. To identify the unknown station, follow this procedure:

Step 1 - Go to your index (figure 1b) and locate the item number for ITEM NUMBER IDENTIFIERS (20). Turn to item number 20 (figure 4),

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and look down the left-hand column until you find the two-letter identifier, AB. Next, follow this line across the page to the column of item numbers under the correct time period (01) and read the item number of the unknown station (6A).

Step 2 - Turn to the CEOI item number (6A) (figure 2a). Look under the correct time period (01) for the first three characters of the unknown callsign (S9A). Reading over to the left-hand column, you find this to be the 1/77 INF BN.

Step 3 - To identify the last two characters of the unknown station callsign (17), go to the CEOI item for suffixes (2) (figure 3). Look down the left-hand column until you find the number 17. Read to the right to identify the unknown station as an S2.

In this manner, you have completely identified the unknown station as the S2, 1/77 INF.

NOTE: The CEOI extract and the performance measures section under the task: USE KAL-61B, 1400 NUMERICAL CODE TO AUTHENTICATE TRANSMISSION AND ENCRYPT NUMBERS AND GRID ZONE LETTERS, may be cut out and used as a training CEOI.

(PROTECTIVE MARKING)

KTC 600 Series INDEX 1

ITEM	ITEM NO
INDEX	1
SUFFIXES	2
CDR QUICK REF MAJOR SUBOR ELMS AND CBT BNS CALL SIGNS AND FREQS	3
CDR QUICK REF DIV AND SUPPORT	3A
CDR QUICK REF 1ST BDE	3B
CDR QUICK REF 2ND BDE	3C
CDR QUICK REF 3RD BDE	3D
CDR QUICK REF DIVARTY	3E
CDR QUICK REF DISCOM	3F
CDR QUICK REF RATT	3G
CDR QUICK REF SSB VOICE	3H
2ND INF DIV (MECH) CALL SIGNS AND FREQS	4
DIV ADMIN	4A
DIV OPS INTEL RATT	4B
DIV ADMIN LOG RATT	4C
DIV TOC SSB VOICE	4D
TC CALL SIGNS AND FREQS	5
ST BDE CALL SIGNS AND FREQS	6
1 77 INF BN	6A
1 78 INF BN	6B
1 2 ARMD BN	6C
1ST BDE RATT	6D
ND BDE CALL SIGNS AND FREQS	7
1 79 INF BN	7A

NDEX 1 of 4 1

Figure 1a.

(PROTECTIVE MARKING)

KTV 600 Series INDEX 1

ITEM	ITEM NO
1-441 ADA BN CALL SIGNS AND FREQS	12
FAAR PLT	12A
1-441 ADA BN SSB VOICE	12B
52ND ENGR BN CALL SIGNS AND FREQS	13
52ND ENGR ADM PLT SSB VOICE	13A
52ND MP CO CALL SIGNS AND FREQS	14
52ND MI CO CALL SIGNS AND FREQS	15
52ND SIG BN CALL SIGNS AND FREQS	16
52ND AVN BN CALL SIGNS AND FREQS	17
AHC 52ND AVN BN	17A
AHC PLT'S	17B
GEN SPT CO 52ND AVN BN	17C
52ND ASA CO CALL SIGNS AND FREQS	18
52ND ASA CO RATT	18A
SPARE CALL SIGNS AND FM FREQS	19
SPARE CALL SIGNS AND FM FREQS	19A
SPARE CALL SIGNS AND VHF FREQS	19B
SPARE CALL SIGNS AND UHF FREQS	19C
SPARE CALL SIGNS AND HF FREQS	19D
ITEM NUMBER IDENTIFIERS	20
PYROTECHNIC AND SMOKE SIGNALS	21
SIGNS AND COUNTERSIGNS	22

INDEX 3 of 4 1

Figure 1b.

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(PROTECTIVE MARKING)

KTV 600B CALL SIGNS

1-77 INF BN — 6A

	01	02	03	04	05
1-77 INF BN	S9A	I2L	P9T	Z1N	I3L
HHC	B7J	G8X	K4H	O3E	K4C
A Co	M1C	R4M	N3X	T1K	K7X
1ST PLT	J1M	K2J	V6N	G8L	F1G
2ND PLT	V7D	R8O	E0P	K2W	W2R
3RD PLT	D2H	W5K	K1J	G5M	D5P
MORTAR PLT	C4B	J2A	P7K	E5Y	F5W
B CO	Y6Y	P0Z	L0Q	K6R	C6J
1ST PLT	P0F	B6R	X1A	P1U	R2N
2ND PLT	S2X	H7H	V8I	Y7C	G2V
3RD PLT	L7T	L7Q	Q7V	S5A	I4Z
MORTAR PLT	R9V	B7W	D1S	P7D	B2B
C CO	G1Q	J6N	E6F	M4B	A0T
1ST PLT	N7O	P9U	B6B	N5V	P7U
2ND PLT	B9S	Y6D	K2R	R7O	I6Y
3RD PLT	H8P	P7I	Z6L	B4Q	T1I
MORTAR PLT	A5L	Q2C	A8E	Y8F	V6D
CSC	C0W	O4B	N7C	O6H	S4H
AT PLT	A2E	N9P	E4W	N2G	L6E
MORTAR PLT	J6Z	U2G	U6G	Q5Z	W0M
RECON PLT	E4G	B6F	R0Z	D0T	E8S
REDEYE SEC	J7I	Z0S	A6O	Q5J	U1K
GND SURVL SEC	G5U	L2Y	T8D	F1I	U4O
MEDEVAC	Q5J	A6I	V2S	W0P	O2O

1-77 INF BN — 6A

Figure 2a.

(PROTECTIVE MARKING)

KTV 600 B FREQUENCIES — 6A

1-77 INF BN	01	02	03	04	05
1-77 INF CMD	52 800	61 950	35 050	61 550	60 700
1-77 INF A L	49 300	64 200	31 500	39 250	41 200
A CO CMD	35 950	40 600	35 550	34 600	30 250
1ST PLT	52 450	52 550	47 900	53 150	51 700
2ND PLT	53 100	52 500	52 050	52 750	50 850
3RD PLT	47 500	53 450	52 350	52 550	52 150
MORTAR PLT	71 450	66 450	59 450	68 050	70 650
B CO CMD	44 850	56 750	71 850	55 200	56 250
1ST PLT	53 350	52 650	50 950	53 350	53 750
2ND PLT	50 150	48 800	53 100	52 350	52 450
3RD PLT	53 650	52 050	53 700	50 950	48 050
MORTAR PLT	49 150	49 050	40 950	71 200	62 550
C CO CMD	56 150	66 850	54 750	49 850	45 550
1ST PLT	50 450	53 100	51 200	52 650	53 250
2ND PLT	52 550	48 100	52 950	53 100	50 650
3RD PLT	51 600	48 700	53 350	53 500	52 100
MORTAR PLT	56 600	55 850	47 950	45 800	43 300
CSC CMD	57 800	34 900	34 250	35 850	61 450
AT PLT	54 850	65 650	35 350	49 300	66 250
MORTAR PLT	46 450	58 900	64 200	61 300	68 550
RECON PLT	71 850	55 900	72 900	39 500	72 550
REDEYE SEC	46 250	36 400	73 000	45 150	75 900
GND SURVL SEC	39 500	41 700	58 200	73 000	47 700
1-77 AJ ALT 1	53 000	33 350	73 150	56 750	59 800
1-77 AJ ALT 2	40 050	71 500	59 000	73 300	65 800
MEDEVAC P	35 200	43 800	48 500	69 000	73 150

1-77 INF BN — 6A

Figure 2b.

(PROTECTIVE MARKING)

KTV 600 B — 2

SUFFIXES--TIME PERIOD 01

01 TARGET ACQ OFF	31 TM/SQD/SEC/DET/TK 7
02 AID--DE--CAMP	32 LN OFF 4
03 C--E OFF	33 TM SQD/SEC/DET/TK 8
04 MAINT OFF	34 ATSE
05 AIRCRAFT 12	35 FO/RECON/TACP 6
06 G3/S3 AIR	36 COMSEC OFF
07 MATERIEL OFF	37 TRANS/MOTOR OFF
08 AVLB SEC	38 FSE
09 G1/S1	39 EW OFF
10 MET	40 CHIEF OF STAFF/XO
11 ASA OFF	41 SURGEON/MED OFF
12 FO/RECON/TACP 1	42 FO/RECON/TACP 5
13 PLT/SEC/TEAM LDR	43 ACE
14 AIRCRAFT 6	44 HQ COMDT
15 FO/RECON/TACP 3	45 FDC
16 FSCOORD	46 TM/SQD/SEC/DET/TK 1
17 G2/S2	47 AIRCRAFT 1
18 AG	48 AME
19 SURVEY OFF	49 RADAR
20 FLT OPS	50 AIRCRAFT 10
21 AIRCRAFT 8	51 AIR DEFENSE OFF
22 RECOVERY VEH	52 CHAPLAIN
23 G3/S3	53 AIRCRAFT 5
24 IG	54 SPARE 9
25 PLT/SEC/TEAM SGT	55 ENGR OFF
26 LN OFF 3	56 NCS
27 TOC/CP	57 FO/RECON/TACP 2
28 SGM/CSM	58 AIRCRAFT 7
29 G4/S4	59 SPARE 8
30 NAICO	60 SPARE 2

SUFFIXES — 1 OF 20 — 2

Figure 3.

(PROTECTIVE MARKING)

KTV 600 B — 20

ITEM NUMBER IDENTIFIERS

	01	02	03	04	05	06	07	08	09	1
AA	19A	3G	19A	13A	11A	7	9B	9F	13	1
AB	6A	10B	9B	9A	12	19B	8C	7A	4	8
AC	3H	4C	19D	4D	6	3B	19B	14	9F	10
AD	8	12A	3F	7B	19D	7B	3A	19A	4D	10
AE	3A	4A	12A	3B	6C	10E	4D	10B	17B	
AF	3C	10A	3E	10E	9E	8E	6D	16	10D	19
AG	3E	4D	7	19D	11	16	3E	9C	11A	1
AH	9F	13	10C	19A	15	3D	9D	8E	17A	3
AI	7	7C	8D	10C	10B	7D	4B	11B	7B	7
AJ	6	10C	13	6D	13A	9	5	13	7A	8
AK	18	3D	16	8A	17B	5	3B	3E	8C	
AL	17	10E	3	5	9A	9A	13	8C	4C	6
AM	10C	19C	10	9D	8C	8A	10C	7D	19C	11
AN	12	12	3D	10A	9C	4B	8B	4D	9C	18
AO	6B	19B	9A	10	12B	10D	10E	5	14	9
AP	8D	19	19	3D	3D	17B	3H	10E	9	17
AQ	9	8E	11A	9	9	14	11B	11	3E	
AR	7D	15	12	6	17A	19C	19C	3F	3F	9
AS	3G	9E	9	18A	5	11A	18A	18A	17C	3
AT	7C	7A	17	8D	10D	4D	9F	17A	9A	
AU	9B	3A	9F	6C	6A	3H	6A	9E	19A	12
AV	3F	3B	18A	12	3H	4	8A	9D	3D	
AW	19B	8C	8B	7A	7C	17A	7	15	6D	
AX	10A	18A	14	8	17	8C	3F	19D	13A	17
AY	5	11A	7A	6A	8B	17	10	17	3	
AZ	16	17B	4D	12A	3G	3C	3G	17B	19D	

ITEM NUMBER IDENTIFIERS — 1 OF 3

Figure 4.

REFERENCES:

Unit CEOI

TEC Lesson 936-061-0140-F, CEOI, Part 1: How to use the CEOI

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TASK NUMBER: 113-571-2001

USE KAL-61B 1400 NUMERICAL CODE TO AUTHENTICATE TRANSMISSIONS AND ENCRYPT/DECRYPT NUMBERS AND GRID ZONE LETTERS

CONDITIONS:

Given dates and times, a KAL 61B with KTC 1400 tables, pencil, paper, and the following items which may be simulated for training only: operational FM radios, a frequency, callsigns, and a sending station.

Situation 1: A contacted station which might be an imposter.

Situation 2: A station requests you to authenticate two phonetic letters.

Situation 3: A requirement to encode specific grid coordinates and transmit them within an otherwise clear text (uncoded) message.

Situation 4: A station, while transmitting, says the words "I set" followed by 8, 10, or 12 phonetic letters.

STANDARDS:

Without error, select the right KTC 1400 for the time period given:

Situation 1: Within 15 seconds (not counting time taken by the other station), transmit, using proper radio procedure, a two-letter challenge, and from the reply determine whether or not the station responded correctly. (If station takes more than 5 seconds to respond, challenge again.)

Situation 2: Within 15 seconds, using the correct radio procedure, respond to the challenge with correct authentication. (If immediately challenged again, respond correctly within 5 seconds.)

Situation 3: Encode the specific grid coordinates without error and transmit them using correct radio procedures.

Situation 4: Decode the words after "I set" without error.

PERFORMANCE MEASURES:

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TO SET UP FOR ENCRYPTING

Step 1. Randomly select any two letters (except Z) for message "SET INDICATOR" (SI). EXAMPLE: CP.

Step 2. Find the first letter "C" of the SI in LINE INDICATOR COLUMN (1).

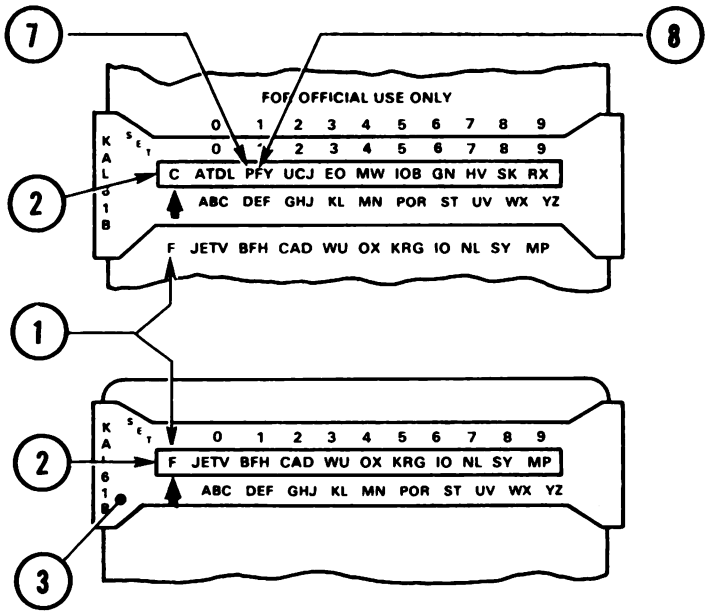
Step 3. Find the second letter "P" of SI in the line indicated by the first letter. Letter to the right of second SI letter is the SET LETTER.

NOTE: If the second SI letter is the last letter in the line, then the first letter in the same line will be the SET LETTER.

Step 4. Find SET LETTER "F" in LINE INDICATOR COLUMN.

Step 5. Position READER GUIDE over line indicated by SET LETTER "F". Device is now ready for encrypting.

1. TO SET UP FOR ENCRYPTING.


7
8
FOR OFFICIAL USE ONLY
0 1 2 3 4 5 6 7 8 9
SET
KAL 61B
C ATDL PFY UCJ EO MW IOB GN HV SK RX
ABC DEF GHJ KL MN POR ST UV WX YZ
F JETV BFH CAD WU OX KRG IO NL SY MP
1
2
3

KAL 61 set up for encrypting.

1. Line Indicator Column
2. Set Letter/First Letter of Set Indicator
3. Reader Guide

7. Second Letter of Set Indicator
8. Set Letter

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TO ENCRYPT NUMBERS

Set KAL 61 for encrypting as indicated in Section 1.

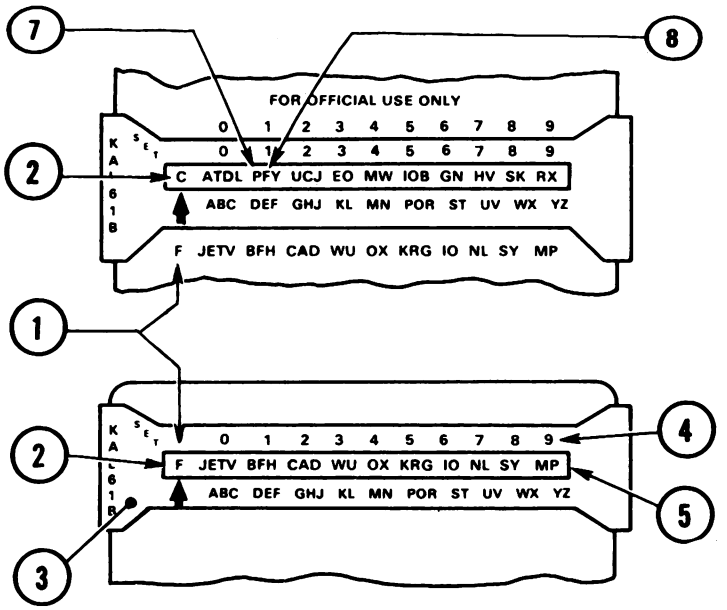
Step 1. Find number to be encrypted in PLAINTEXT NUMBERS (4) on READER GUIDE (3). EXAMPLE: 572938.

Step 2. Substitute for each number one of the CIPHER LETTERS (5) grouped in the set line immediately below the number to be encrypted. Continue to substitute letters from the same SET line until all numbers for that group are encrypted. EXAMPLE: RNAMUS is one possibility. By using variants, others are possible.

NOTE: Numbers will be encrypted one at a time in the same order they appear in the message. A different cipher letter will be used for repeated numbers. If there are more than 15 numbers to be encrypted in the same message, one SET INDICATOR will be used for the first 15 numbers and a different SET INCIATOR for each succeeding group of 1 to 15 numbers. This must be done because the encrypting of more than 15 numbers in the same SET INDICATOR can seriously weaken the security of the system.

2. TO ENCRYPT NUMBERS.

(PROTECTIVE MARKING)


7
8
FOR OFFICIAL USE ONLY
0 1 2 3 4 5 6 7 8 9
SET
KAL 61B
0 1 2 3 4 5 6 7 8 9
C ATDL PFY UCJ EO MW IOB GN HV SK RX
ABC DEF GHJ KL MN POR ST UV WX YZ
F JETV BFH CAD WU OX KRG IO NL SY MP
2
1
2
0 1 2 3 4 5 6 7 8 9
F JETV BFH CAD WU OX KRG IO NL SY MP
ABC DEF GHJ KL MN POR ST UV WX YZ
4
5
3

3. Reader Guide
4. Plaintext Numbers
5. Cipher letters

(PROTECTIVE MARKING)

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ARRANGEMENT AND TRANSMISSION OF MESSAGES

This system is designed to be used with plain text. Therefore, most messages using this system will include both encrypted portions and plaintext portions.
The encrypted portions of your message will be arranged as follows:

a. First two letters will be the SET INDICATOR letters. (NEVER TRANSMIT THE SET LETTER). EXAMPLE: CP. (This is transmitted as "I set CHARLIE PAPA".)

b. If grid zone letters are included, the third and fourth letters will be encrypted grid zone letters. EXAMPLE: XG. (This is transmitted as "X-RAY GOLF".)

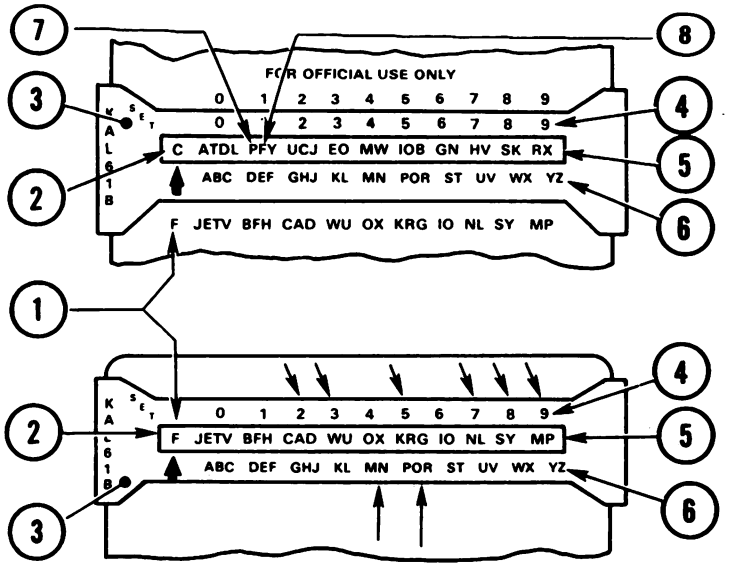
c. Remaining letters (including third and fourth if grid zone letters are not included) will be encrypted numbers. EXAMPLE: RNAMUS. (This is transmitted "ROMEO NOVEMBER ALFA MIKE UNIFORM SIERRA".)

NOTE: An encrypted, six-digit location which includes grid zone letters will consist of ten letters, including the SI which is always the first two letters. The entire encrypted location would be transmitted as "I set CHARLIE PAPA, (pause), X-RAY GOLF ROMEO NOVEMBER ALFA MIKE UNIFORM SIERRA".

4. ARRANGEMENT AND TRANSMISSION OF MESSAGES

(PROTECTIVE MARKING)

NAO 3B



1. Line Indicator Column
2. Set Letter/First Letter of Set Indicator
3. Reader Guide
4. Plaintext Numbers
5. Cipher Letters
6. Plaintext Letters for UTM Grid Zone Designators
7. Second Letter of Set Indicator
8. Set Letter

(PROTECTIVE MARKING)

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NAO 3B

TO DECRYPT

Example encrypted location: CP XG RNAMUS. (Transmitted as, "I set CP (pause) XG RNAMUS".)

Step 1. Find SET LETTER "F" using the SI "CP" as described in "TO SET UP FOR ENCRYPTING" Steps 2 and 3.

Step 2. Decipher message beginning with the third letter "X" by substituting plaintext letters/numbers on the READER GUIDE (3) for the cipher letters.

5. TO DECRYPT

(PROTECTIVE MARKING)

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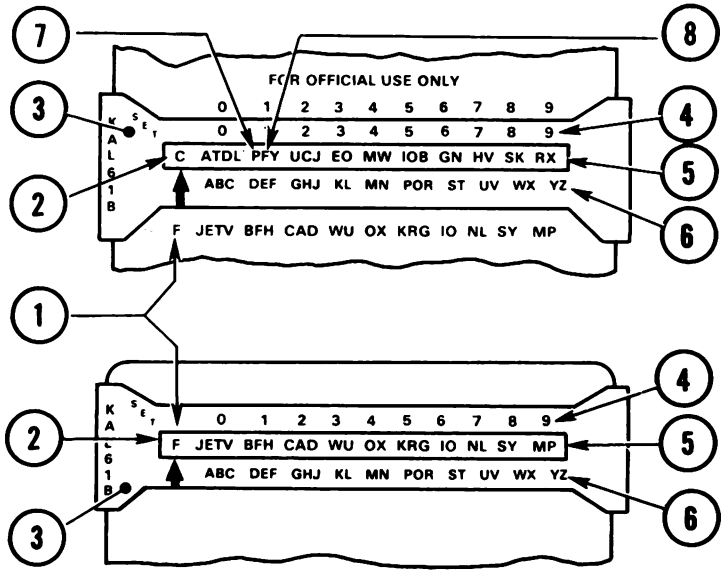
NAO 3B


FOR OFFICIAL USE ONLY
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
C ATDL PFY UCJ EO MW IOB GN HV SK RX
ABC DEF GHJ KL MN POR ST UV WX YZ
F JETV BFH CAD WU OX KRG IO NL SY MP
KAL 61B
SET
1
2
3
4
5
6
7
8

1. Line Indicator Column
2. Set Letter/First Letter of Set Indicator
3. Reader Guide
4. Plaintext Numbers
5. Cipher Letters
6. Plaintext Letters for UTM Grid Zone Designators
7. Second Letter of Set Indicator
8. Set Letter

(PROTECTIVE MARKING)

NOTE: AUTHENTICATION MAY BEST BE ACCOMPLISHED BY MOVING READER GUIDE COMPLETELY OUT OF THE WAY OR ELSE POSITIONING IT SO AS NOT TO OBSCURE REPLY LINE.

TO AUTHENTICATE

Challenge and Reply

Step 1. Select any two letters (except Z) at random for challenge. EXAMPLE: KV.

Step 2. Find first letter "K" of challenge in the LINE INDICATOR COLUMN.

Step 3. Find second letter "V" of challenge in line indicated by first letter. The correct reply (E) is the cipher letter directly under the second letter "V" of the challenge.

NOTE: If the first letter of the challenge is "Y" indicating the last line of the table, the reply should be taken from the "A" line and will be the letter in the same position as the second letter of the challenge in the "Y" line.
If challenged party does not reply within 5 seconds but does reply correctly, challenge that party again using a different challenge.

NOTE: The called party will make the first challenge. Both the person making the challenge and the person being challenged must find the correct reply. The party making the call may then counter-challenge the called party using a different challenge.

Transmission Authentication

One hundred Transmission Authentication digraphs have been provided in this system. They are to be used in cases where authentication is required and it is not possible or desirable that the receiving station reply. The Transmission Authentication table consists of ten numbered columns containing ten digraphs each. Columns have been numbered to make the assignment of Transmission Authentication digraphs easier. Numbered columns should be assigned by the Controlling Authority to selected communications nets within his cryptonet. **Authentication digraphs within the numbered columns should be used only once, and only within the Controlling Authority's net.** When it becomes necessary to use Transmission Authentication, the first or next unused digraph in the assigned column will be used.

6. TO AUTHENTICATE.

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NAO 3B

	0	1	2	3	4	5	6	7	8	9
A	VDFJ	AUM	IHC	EL	XW	YNO	GT	QK	PS	RB
B	CIFN	WKV	BDQ	ES	RH	YOJ	XL	AT	UG	PM
C	QSXJ	CFY	OGD	RT	UA	VIN	KH	EM	WP	LB
D	IOBS	JKQ	FEG	DP	MN	XWL	CH	TA	VU	RY
E	KLPA	MJX	QDY	CH	CW	VFE	BT	RN	UI	OS
F	VUCI	EPA	NXY	TH	BQ	QGJ	LK	WR	FM	DS
G	NYAO	UFK	GJW	QI	DT	BLH	ES	VR	CX	PM
H	KHIV	GYC	RPS	FO	JX	QWA	TU	DB	EM	NL
I	BWOA	DPJ	UGY	NH	RE	VCI	TS	LM	FQ	KX
J	PCWX	RQF	JVM	OY	HS	EGD	BN	KT	UA	IL
K	CQPK	ASM	TDJ	WX	IH	NUR	GB	OL	YE	VF
L	BWRF	JPC	QON	AV	HG	IML	DU	SK	YX	ET
M	HQIA	XLC	FVB	SK	OJ	MUD	RW	YN	GE	TP
N	CWQF	KJS	XHP	AE	TN	UGY	VL	MD	RI	OB
O	NWFD	QBS	RJX	PH	YT	ICM	OG	AV	LU	KE
P	PAFT	NSC	DGR	QM	WX	HKI	OE	YJ	UB	LV
Q	SNGD	JTP	WYI	CR	BE	UOV	MX	FH	QK	LA
R	AMRH	NJG	QUY	SE	IO	KDL	PV	XC	WB	FT
S	YWGS	VXE	IDC	KQ	OA	TPH	BU	JR	ML	NF
T	BCDL	FOR	AUT	NV	GW	SXK	PI	ME	HQ	JY
U	RMQD	WVS	YJX	TG	UL	FEK	PB	OA	NH	IC
V	BOKA	HXG	SLC	PD	JT	EFQ	IV	WM	RN	UY
W	ASLW	YVD	TRO	BE	CI	PFX	HG	MN	JQ	KU
X	DLTV	NEQ	PAS	XB	OC	MHJ	KW	RF	IG	YU
Y	XSIC	YGP	NFW	HE	KL	JAR	VO	QD	TM	BU

DAY 17

KTC 1400 A

7. SAMPLE TABLE

(PROTECTIVE MARKING)

NAO 3B

SECURITY THOUGHTS

Following are common rules to achieve security:

a. Change message set after 15 numbers are encrypted.

b. Encrypt brevity values.

c. Never encrypt or decrypt a message and then repeat it in plain language.

d. Avoid the encrypting of information known to the enemy.

e. Make all transmissions as short as possible.

f. Remember that anyone can listen to your transmission.

INSTRUCTIONS FOR INSERTING CIPHER TABLE IN KAL 61

1. Unfasten flap at the bottom of device and bend back out of the way.

2. Slide the cipher table face up under the lips at the top and sides of the device.

3. Before refastening the flap, adjust cipher table so that the top register marks (+) at the bottom of the table will align precisely with the snaps when the flap is fastened.

TRANSMISSION AUTHENTICATION TABLE

01	02	03	04	05	06	07	08	09	10
HA	VX	YM	WT	MY	OE	JR	AY	RB	IP
DM	VB	ZF	MP	QV	XI	TX	TF	WE	VH
JP	YQ	QL	MA	SS	JZ	SG	XJ	EX	AO
SQ	VC	OR	IS	BM	HN	HB	VN	HW	ZK
NK	UD	FU	CM	YF	YN	HM	NF	VK	EG
OD	CC	WA	UF	QC	OQ	MW	GD	CD	XA
SW	MQ	QP	ES	YL	ZY	SV	IB	AR	ZL
RG	KM	RL	GO	OF	OK	BX	II	ND	EA
MM	OH	QK	RZ	NE	ZT	AN	FG	GB	PB
IF	DC	UV	SB	FA	VZ	MD	BD	XE	HR

DAY 23

KTC 1400

A

(PROTECTIVE MARKING)

NOTE: NEVER self-authenticate using challenge and reply authentication. If self-authentication is required, use one of the two letter digraphs found in the Transmission Authentication Table (KTC 1400) assigned to your unit.

REFERENCE:

TC 24-2, The Automated "CEOI", Dec 75 (all)

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TASK NUMBER: 113-571-2002

ENCODE AND DECODE MESSAGES USING A KTC-600 TACTICAL OPERATIONS CODE

CONDITIONS:

Given dates and times, CEOI, tactical operations code KTC-600, and a message to be encoded or three-letter code groups to be decoded.

STANDARDS:

Encode or decode the message, without error, within 30 seconds per code group or word/phrase.

PERFORMANCE MEASURES:

1. **Use of code sets.** Each set of the KTC-600 tactical operations code is effective for a given time frame, not to exceed 48 hours. Time of change will be directed in the CEOI (could be days of the month or days of any given operation). Sets are used as follows:

EXAMPLE ONLY

SET	EFFECTIVE DAYS (of the month or operation as directed by the CEOI)
1	1 and 2
2	3 and 4
3	5 and 6
4	7 and 8

2. **To encode.**

a. After writing out your message in plain text, turn to the code set used on that day (see example above; on the 5th day of the month (or operation), you would use set 3).

b. The encoded portion of the operations code is made up of words and phrases commonly used in tactical operations which are arranged in alphabetical order as in a dictionary. To the left of each is a three-letter code group which is the code for that word or phrase.

c. Procedure to encode words or phrases:

(1) Find the word or phrase to be encoded.

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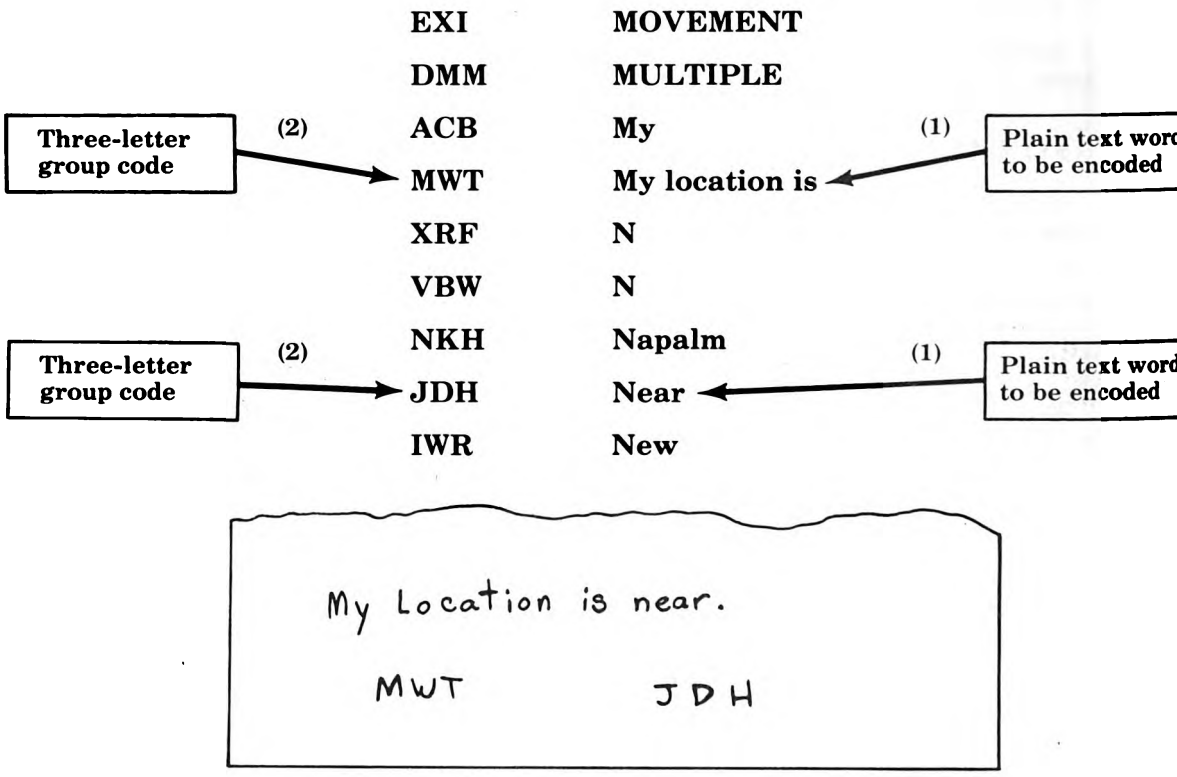
(2) Identify the three-letter code group located to the left of that word or phrase.

(3) Write that three-letter code group under the word or phrase where you have written out the message to be encoded.

(4) Repeat this procedure until the whole message is encoded.

(EXAMPLE ONLY)

Message: "My location is near."



NOTE: Two code groups are provided for spelling a word that contains double letters. Do not use identical code groups side by side when you are spelling a word that contains double letters.

3. **To decode.**

a. After receiving and writing down the encoded message, check the CEOI and turn to the code set in effect for that day.

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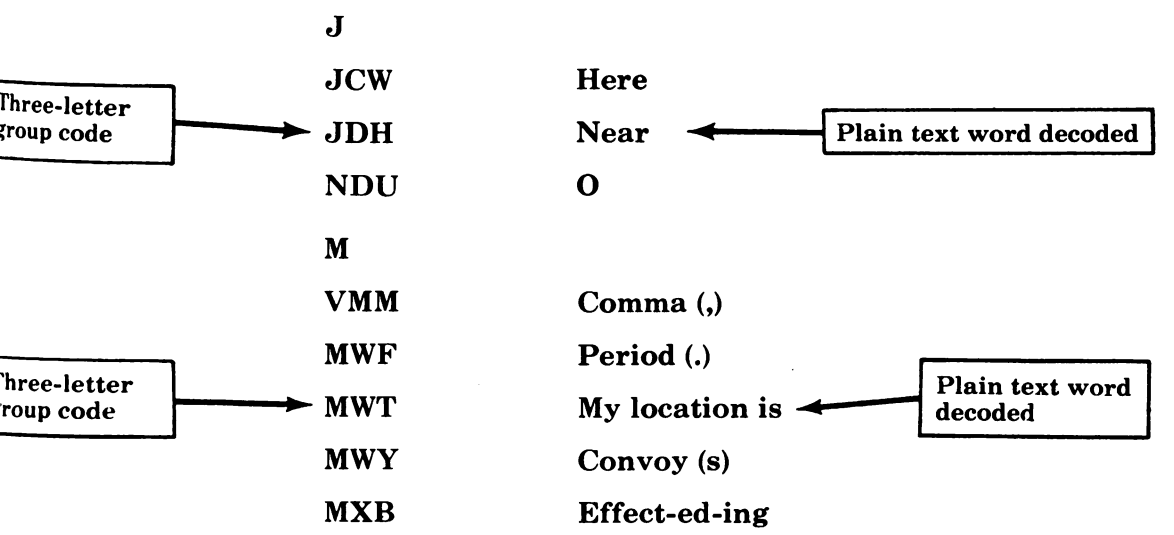
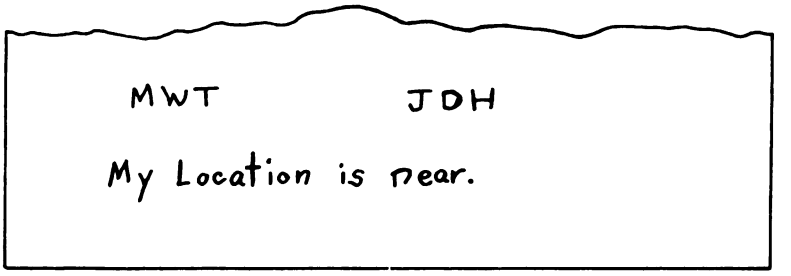
b. The decode portion of the operations code is made up of a column of three-letter code groups in alphabetical order (AAO, ABL, ABY, etc.) with a word or phrase to the right of each group.

c. To decode a received message, find the code group and write the word/phrase next to it under that group in the encoded message which you copied.

(EXAMPLE ONLY)

Coded Message: "MWT JDH"





NOTE: You can save some time when encoding or decoding by going in alphabetical order. When encoding, look up all words/phrases starting with A, then B, etc. When decoding, look up all code groups beginning with A, then B, etc.

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4. **Radio procedure.**

a. After contact is established, the station sending the encoded message uses the following prowords/procedures.

(1) "Message". Lets the receiving station know that a message is going to be sent THAT REQUIRES RECEIVING STATION to copy.

(2) "Groups". The number of groups in the message is provided so that the receiving station can check his copy. The receiving station should write this number down.

(3) Groups are transmitted phonetically (that is, each letter is pronounced as a word, as given in the military phonetic alphabet). Transmission should be slow, with a pause between each group.

EXAMPLE: If station F07 is going to transmit the message, "Execute plan B" to station F26 and the encoded message is "BCA ONM ZYX," the transmission would be: (-- indicates a pause)

(sending station) "FOXTROT TOO SIX -- THIS IS FOXTROT ZERO SEVEN -- MESSAGE - OVER"

(receiving station) "FOXTROT TOO SIX -- OVER"

(sending station) "GROUPS THREE -- "

BRAH-VOH	**CHAR-LEE**	**AL-FAH**
-- OSS-CAH	**NO-VEM-BER**	**MIKE**
-- ZOO-LOO	**YANG-KEY**	**ECKS-RAY**
-- OVER		

b. After the message is received and copied, and before it is decoded, the following procedures and prowords may be used:

(1) "Interrogative groups". Used by the receiving station when his group count is not the same as the sending station told him it would be. The receiving station's group count follows the word "groups".

(2) "Correct, out". Used by the sending station when the receiving station's interrogative group count is correct.

(3) "Groups" followed by a series of phonetic letters. Used by the sending station when the interrogative group count is wrong. The right group count follows the word "groups" and the first letter of each group is sent again. The receiving station checks these letters against the message he copied and finds his mistake.

(4) "Say again." Used by the receiving station to ask the sending station to retransmit a group(s) not received. The number of the group missed is put in the blank (Example: "Say again five" means that the sending station should resend the fifth group in the message).

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c. Once the message has been decoded and a word (or all of the message) does not make sense, the receiving station should:

(1) Check to see if he has used the right code set.

(2) If the right code set was used, the receiving station should recontact the sending station and have him check the code group (or message) by using the pro-word "verify." (Examples: "Verify ONM" if ONM when decoded does not make sense; or "Verify message" if the whole message does not make sense.) The sending station then encodes and sends that portion again.

NOTE: Each set in the operations code has "spares" assigned. These spares can be used if all stations are informed of their meaning in advance. A word not included in the code or an entire message may be assigned to a "spare" group, or be spelled out using the letters listed in the operations code for that set.

REFERENCES:

Unit CEOI (Communications-Electronic Operating Instructions) (Classification)
TEC Lesson 936-061-0109-F, RTP: Part 2, Writing down messages received by radio
TEC Lesson 936-061-0111-F, RTP: Part 4, Preparing messages to be sent
TEC Lesson 936-061-0112-F, RTP: Part 5, Sending & Receiving Messages

NOTE: This instruction is not classified insofar as explaining encoding and decoding messages.

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TASK NUMBER: 113-571-1003

ESTABLISH AND ENTER OR LEAVE A RADIO NET

CONDITIONS:

1. **Situation 1:** Given an operational tactical FM radio set, the appropriate CEOI extracts, KAL 61 and KTC 1400, two or more stations, and a requirement to establish a radio net.

2. **Situation 2:** Given you are operating in an established radio net, appropriate CEOI extracts, KAL 61 and KTC 1400, and a requirement to enter a radio net in which you do not normally operate.

STANDARDS:

1. **Situation 1:** Open the net for traffic by transmitting the net callsign and the additional calls required to get a responding call to the net control station (NCS).

2. **Situation 2:** Using the appropriate CEOI extract, determine the frequency and callsigns for the net you are to enter and your item number identifier, then request permission to leave your net and enter that net.

PERFORMANCE MEASURES:

1. When establishing a radio net, the following actions must be accomplished:

a. Extract appropriate callsigns, suffixes, and frequency from the CEOI.

b. Prepare and operate the appropriate FM radio set.

c. Identify the net structure and determine the answering sequence, and make the appropriate response to the individual stations (figure 1).

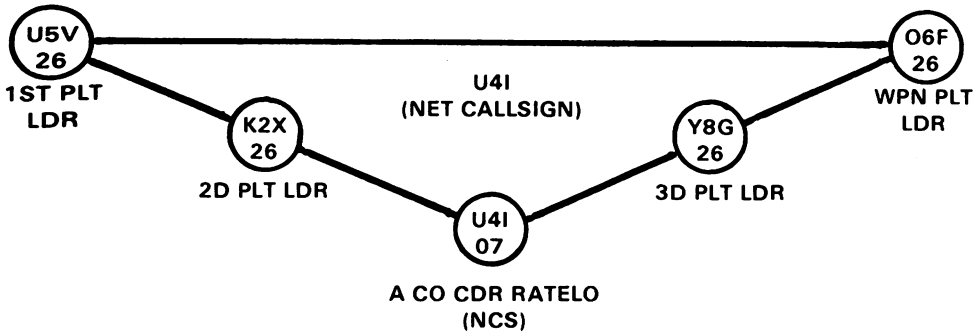

Figure 1.

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(1) Establishing a net.

(a) Proper control by the NCS and adherence to operating rules by subordinate stations will enable a radio net to begin, maintain, and exchange messages with minimum delay. The use of procedure as prescribed herein must be followed when establishing a net.

EXAMPLE: When ready to establish the net, U4I07 transmits: U4I - THIS IS U4I07 - OVER.

(b) Each subordinate station then answers the call in alphabetical-numerical order according to callsigns.

U4I07 - THIS IS 06F26 - OVER

U4I07 - THIS IS Y8G26 - OVER

U4I07 - THIS IS U5V26 - OVER

U4I07 - THIS IS K2X26 - OVER

(c) The NCS now calls the net to inform all stations that their transmissions were received satisfactorily, and that he has no messages for them.

U4I - THIS IS U4I07 - ROGER - OUT

(2) Upon direction of the NCS, provided no confusion will result, callsigns other than the net callsign may be abbreviated by omitting their first two characters.

(3) All stations in the net should be prepared to authenticate when challenged.

(4) If any stations in the net do not answer the net callsign, the NCS will make individual calls to those stations in an attempt to establish communication.

(5) If any station in the net is unable to communicate with the NCS due to faulty equipment or unsuitable location, a report will be made to the NCS as soon as possible by means other than radio.

2. When entering a net in which you do not normally operate, the following procedure normally will be used:

Step 1. Request permission from your NCS to leave your assigned radio net.

Step 2. Go to the index of your CEOI and find the Item Number Identifier item number; turn to that item number and determine your two-letter identification using the correct time period.

Step 3. Using your CEOI index, locate the net for which you wish to enter, and turn to that item number; obtain the NCS callsign and the callsign of the station that you wish to send a message to.

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Step 4. Determine the correct frequency using the CEOI for the net you are to enter.

Step 5. Call the NCS station for the net for which you wish to enter and request permission to enter the net.

NOTE: Before transmitting, monitor the frequency to insure you do not cut in on someone else's transmission.

Step 6. The NCS will require you to authenticate prior to giving you permission to enter the net. After permission is granted to enter the net, send your message.

Step 7. After sending your message, request permission to leave that net from the NCS. Upon receiving permission to leave the net, call your NCS and request permission to reenter the net.

EXAMPLE: "T3F07" wishes to enter a net which is controlled by "R7G28."

ROMEO SEVEN GOLF TOO AIT - THIS IS TANGO TREE FOXTROT ZERO SEVEN - REQUEST PERMISSION TO ENTER THE NET - OVER

TANGO TREE FOXTROT ZERO SEVEN - THIS IS ROMEO SEVEN GOLF TOO AIT - AUTHENTICATE ----- ----- OVER

ROMEO SEVEN GOLF TOO AIT - THIS IS TANGO TREE FOXTROT ZERO SEVEN - I AUTHENTICATE ----- ----- OVER

TANGO TREE FOXTROT ZERO SEVEN - THIS IS ROMEO SEVEN GOLF TOO AIT - ROGER - IDENTIFY YOUR STATION - OVER

ROMEO SEVEN GOLF TOO AIT - THIS IS TANGO TREE FOXTROT ZERO SEVEN - REFER TO ALPHA CHARLIE - OVER

TANGO TREE FOXTROT ZERO SEVEN - THIS IS ROMEO SEVEN GOLF TOO AIT - ROGER - PERMISSION GRANTED TO ENTER THE NET - OUT

3. Any station desiring to leave a net simply requests permission from the NCS.

REFERENCES:

FM 24-1, Combat Communications, Sep 76 (app N, pages N-1 thru N-3, N-9 thru N-14)
TC 24-2, Communications-Electronics Operation Instructions, Dec 75 (part 2, pages 10 thru 11; part 5, pages 23 thru 42)
ACP-125 (D), Communications Instructions -- Radio-Telephone Procedure, Jul 70 (chap 3, pages 3-1 and 3-3 thru 3-25, para 301 thru 321)
TEC Lesson 936-061-0113-F, RTP: Part 6, Entering and Leaving a Radio Net and Authenticating

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TASK NUMBER: 113-571-1001

TRANSMIT AND RECEIVE A RADIO MESSAGE

CONDITIONS:

Situation 1: Given KAL 61 and KTC 1400, a correctly installed and operational FM radio (vehicular or portable) operating in a net on a designated frequency, and the requirement to transmit a written or oral message to a designated station using correct radio procedures.

Situation 2: Given KAL 61 and KTC 1400, a pencil, paper, a correctly installed and operational FM radio (vehicular or portable) operating in a net on a designated frequency, and the requirement to receive a radio transmission from another station that is either clear text, coded, or a combination of clear text and code.

STANDARDS:

1. Transmit and receive all messages using the correct prowords.

2. Transmit all numerals phonetically as shown in paragraph 2 of the performance measures.

3. Receive a radio transmission by correctly writing the message down and relaying to addressee, or relaying the message orally, word for word as received, to the addressee.

4. Transmit a message, using correct radio procedure and transmit the message as written or stated.

5. State the correct procedures to use if you are being jammed.

PERFORMANCE MEASURES:

1. Transmit PROWORDS where their intended meanings are appropriate as listed below:

PROWORDS LISTED ALPHABETICALLY

PROWORD	EXPLANATION
ALL AFTER	The portion of the message to which I have reference is all that which follows . . . .
ALL BEFORE	The portion of the message to which I have reference is all that which precedes . . . .
AUTHENTICATE	The station called is to reply to the challenge which follows . . . .

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PROWORD	EXPLANATION
AUTHENTICATION IS	The transmission authentication of this message is . . . .
BREAK	I hereby indicate the separation of the text from other portions of the message.
CORRECTION	An error has been made in this transmission. Transmission will continue with the last word correctly transmitted.
GROUPS	This message contains the number of groups indicated by the numeral following . . . .
I AUTHENTICATE	The group that follows is the reply to your challenge to authenticate . . . .
I SAY AGAIN	I am repeating transmission or portion indicated.
I SPELL	I shall spell the next word phonetically.
MESSAGE	A message which requires recording is about to follow. (Transmitted immediately after the call. This proword is not used on nets primarily employed for conveying messages. It is intended for use when messages are passed on tactical or reporting net.)
MORE TO FOLLOW	Transmitting station has additional traffic for the receiving station.
OUT	This is the end of my transmission to you and no answer is required or expected.
OVER	This is the end of my transmission to you and a response is necessary. Go ahead; transmit.
RADIO CHECK	What is my signal strength and readability, i.e., how do you hear me.
ROGER	I have received your last transmission satisfactorily, loud and clear.
SAY AGAIN	Repeat all of your last transmission. Followed by identification data means "Repeat——(portion indicated)."
THIS IS	This transmission is from the station whose designator immediately follows.
TIME	That which immediately follows is the time or date-time group of the message.
WAIT	I must pause for a few seconds.

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PROWORD	EXPLANATION
WAIT-OUT	I must pause longer than a few seconds.
WILCO	I have received your signal, understand it, and will comply. To be used only by the addressee. Since the meaning of ROGER is included in that of WILCO, the two prowords are never used together.
WORD AFTER	The word of the message to which I have reference is that which follows . . . .
WORD BEFORE	The word of the message to which I have reference is that which precedes . . . .

2. Transmit isolated letters and abbreviations; phonetically spell unusual or difficult words using the phonetic alphabet as listed below: (See sample message transmission for correct procedure.)

A	B BRAVO (BRAH VOH)	C	D DELTA
E	F	G	H
I	J	K	L
M	N	O	P
Q	R	S	T
U	V	W	X
Y YANKEE	Z	1	2
3 TREE	4 FOW-er	5	6
7 SEV-en	8 AIT	9 NIN-er	Ø ZE-RO

Accented syllables are underlined.

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3. Numbers will be transmitted digit by digit except that exact multiples of thousands may be spoken as such. However, there are special cases, such as identifying a specific code group in a coded message, when the normal pronunciation of numerals is prescribed; for example, 17 would then be "seventeen."

NUMERAL	SPOKEN AS
44	FOW-ER FOW-ER
90	NIN-ER ZE-RO
136	WUN TREE SIX
500	FIFE ZE-RO ZE-RO
1200	WUN TOO ZE-RO ZE-RO
1478	WUN FOW-ER SEV-EN AIT
7000	SEV-EN TOU-SAND
16000	WUN SIX TOU-SAND
812681	AIT WUN TOO SIX AIT WUN

SAMPLE MESSAGE: ROAD TO TILLEPS WILL BE FLOODED BY 1800 HRS. INITIATE PLAN B.

TRANSMITTING STATION CALLSIGN: Z8C28

RECEIVING STATION CALLSIGN: U4I07

——— (SAMPLE TRANSMISSION) ———

(TRANSMITTING STATION):

INDIA ZERO SEVEN - THIS IS CHARLIE TOO
AIT - MESSAGE - OVER

(RECEIVING STATION):

INDIA ZERO SEVEN - OVER

(TRANSMITTING STATION):

ROAD TO TILLEPS - I SPELL - TANGO INDIA LIMA LIMA ECHO PAPA SIERRA - TILLEPS - WILL BE FLOODED BY WUN AIT ZERO ZERO HOTEL ROMEO SIERRA - PERIOD - INITIATE PLAN BRAVO - PERIOD - OVER

(RECEIVING STATION):

WILLCO - OUT

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4. Jamming is intentional radio interference caused by the enemy. If the enemy has the capability to jam the frequencies used, each radio operator should:

a. Learn to recognize enemy jamming and report details to the supervisor of the radio station.

b. Learn to readjust the set to minimize the effects of enemy jamming.

c. Operate with minimum power until jammed – then increase the power.

d. Shift to alternate frequencies and callsigns as directed.

e. Authenticate all transmissions.

f. KEEP OFF THE AIR as much as possible. Transmit only when absolutely necessary.

g. Observe radio discipline at all times.

h. Keep transmissions as short as possible.

i. Keep calm, keep trying, and keep operating when the circuit is jammed.

j. Do not mention you are being jammed on the radio.

REFERENCES:

FM 24-1, Combat Communications, Sep 76 (app N, pages N-1 thru N-5, N-9 thru N-14)
ACP-125 (D), Communications Instructions -- Radio-Telephone Procedures, Jul 70 (chap 3, page 3-1, para 3-2; pages 3-8 thru 3-10, para 3-7 thru 3-9; page 3-22, para 3-18)

TEC Lesson 936-061-0108-F, RTP: Part 1, Initiating and Responding to Radio Call
TEC Lesson 936-061-0109-F, RTP: Part 2, Writing Down Messages Received by Radio
TEC Lesson 936-061-0110-F, RTP: Part 3, Responding to Messages
TEC Lesson 936-061-0111-F, RTP: Part 4, Preparing Messages to be Sent
TEC Lesson 036-061-0112-F, RTP: Part 5, Sending and Receiving Messages

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TASK NUMBER: 113-594-2005

PREPARE/OPERATE SWITCHBOARD SB-993 (81-MM MORTAR ONLY)

CONDITIONS:

Given an SB-993, a radio/wire net CEOI, switchboard designators, and 3 personnel with equipment to act as receiving stations.

STANDARDS:

Place the SB-993 into operation and make communication check with receiving stations within 5 minutes.

PERFORMANCE MEASURES:

1. **General.** Manual telephone switchboards are designed for use in several types of operation, such as common battery (CB), local battery (LB), and common battery signaling (CBS). In a common-battery system, the source of electrical energy for speech and ringing signals is located at the switchboard telephone central. In a local-battery system, this source of electrical energy is supplied by the station (both the switchboard and the telephone set). In the other system (CBS, LB operation), the source of power for speech is part of the telephone set; the power for signaling the switchboard is located at the switchboard.

2. **Manual Telephone Switchboard SB-993 ()/GT.** Manual telephone switchboard SB-993/GT (figure 1) is a light, portable local battery switching center normally used in company-size units. It consists of a plug holder and seven two-pronged adapter connectors U-184 ()/GT in a case. A field telephone is required for the operator's use. The SB-993()/GT may be used as an emergency field replacement for any local battery switchboard. Manual telephone switchboard SB-993/GT weighs 2¼ pounds. It will handle an operator's line and six local battery wire circuits. Manual telephone switchboard SB-993/GT consists of --

a. A canvas carrying case to protect and carry the switchboard when not in use.

b. An adapter connector holder to hold the adapter connectors in position for operation.

c. Seven adapter connectors U-184/GT, six of which are used to attach the six incoming wire circuits to the switchboard. The seventh adapter connector is connected to a field telephone for the switchboard operator.

d. A 7-foot mounting strap to secure the adapter connector holder to a tree or table for support when in use.

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3. **Adapter Connector U-184/GT.**

a. Each adapter connector U-184/GT consists of a neon glow lamp, two binding posts, two plugs, and two jacks, all molded together in a translucent plastic housing. The connectors serve as the thumbscrew ends of binding posts to which incoming lines are connected. The connectors may be inserted into the jacks of another adapter connector U-184/GT to connect two lines.

b. Several adapter connectors U-184/GT can be connected in tandem for conference connections (several separate parties conversing at the same time).

c. An incoming ringing signal lights the neon lamp in the switchboard plug connected to the line, for the duration of the signal. An audible signal is not heard when the neon lamp lights, unless the switchboard operator's telephone is connected to that line. Thus, the operator must be constantly watching for an incoming signal.

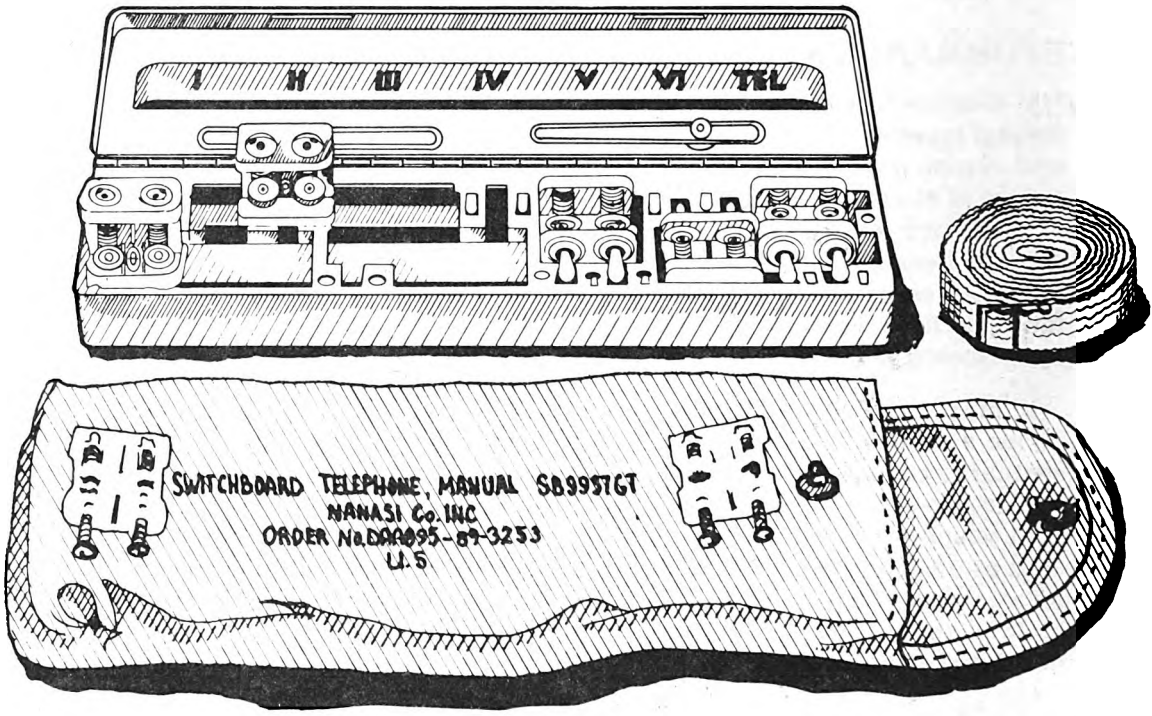

Figure 1.

REFERENCES:

FM 24-20, Field Wire and Cable Techniques, Feb 70 (chap 12, pages 244 thru 246, para 154 thru 156)
TM 11-5805-294-15, Switchboard, Telephone, Manual SB-992/GT, Oct 59, (chap 2, pages 6-7, para 7-11)

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TASK NUMBER: 113-594-2004

PREPARE MANUAL TELEPHONE SWITCHBOARD SB-22/PT OR SB-22A/PT FOR OPERATION (107-MM MORTAR ONLY)

CONDITIONS:

Given a manual telephone switchboard SB-22/PT or SB-22A/PT, a wire net, CEOI switchboard designators, wire pliers, tags, WD-1/TT wire, grease pencil, four BA-30 batteries, and TM 11-5805-262-12.

STANDARDS:

Place the switchboard into operation within 15 minutes, IAW the performance measures below.

PERFORMANCE MEASURES:

1. **General.**

a. Manual telephone switchboards can be used in several types of systems, such as common battery (CB), local battery (LB), and common battery signaling (CBS). In a common battery system, the source of electrical energy for speech and ringing signals is located at the central switchboard. In a local battery system, this source of electrical energy is supplied by the stations (both the switchboard and the telephone set). In the other system (CB, LB operation), the source of power for speech is a part of the telephone set; the power for signaling is located at the switchboard.

b. Manual telephone switchboard SB-22/PT is a piece of single-position field equipment, used in field wire systems. It is small, lightweight, portable, and waterproof, and it needs no special mounting equipment for operation.

c. The switchboard can interconnect local battery telephone lines, voice-frequency teletypewriter circuits, and remote control circuits for radio communication. Each switchboard can switch 12 field telephones.

2. **Preparation of the SB-22/PT for operation.**

a. Preparing the operator's section.

(1) Select a flat surface and lay switchboard on its side with nameplate up.

(2) Release the front cover latches on each end of the switchboard and remove the front cover.

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(3) Loosen the retaining straps inside front cover and remove the operator's telephone set.

(4) Place cover on top of switchboard (yellow side forward) and secure it in place with front cover latches.

(5) Using a grease pencil, place the callsign or number of the line pack on the white plate located below each line jack.

b. Installing the batteries in battery case.

(1) Remove the rear cover of the SB-22/PT.

(2) Remove the battery case (figure 1).

(3) Insert two BA-30 batteries into each end of the case (figure 2) with the top (+) of each battery facing the open end of the battery case. Place the battery case back into the SB-22/PT. Insure that the case is seated correctly in the retaining springs and contact is made with all four spring contacts (figure 2).

CAUTION: DO NOT screw the end caps onto the battery case too tightly; the battery case or the end caps may be damaged.

c. Preparing and installing WD-1/TT wire.

(1) Tie off to a stationary object each line that is to be connected to the SB-22/PT.

(2) Strip ¼- to ½-inch of the protective case from the running ends of each line to be connected.

(3) Place a tag on each line to identify it with the line pack that it is to be connected to.

(4) Insert about 5 inches of each line through the rubber gaskets located on either side of the SB-22/PT.

(5) Each line pack has a two-line binding post located above the battery case. The back cover of the SB-22/PT has a diagram keyed to each binding post (see figure 1). You should start installing wire with line pack number 1 to avoid misrouting of lines. Connect one strand of WD-1/TT wire to the upper and lower binding post of the line pack.

(6) When the lines for all stations have been installed and the battery case replaced, close the cover of the SB-22/PT.

d. To ground the switchboard.

(1) Scoop out a small hole, about 6 inches deep, at the selected grounding site, as close as possible to the switchboard.

(2) Drive the MX-148/G into the hole until the top of the MX-148/G ground rod is approximately 3 inches above the bottom of the hole.

(3) Cut a length of WD-1/TT field wire long enough to connect between the ground binding post and the ground rod.

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(4) Strip and clean both ends of both conductors for good electrical contact.

(5) Connect one end of the WD-1/TT wire to the terminal on the ground rod.

(6) Slide the other end through the slotted gasket in the switchboard and connect it to the ground binding post.

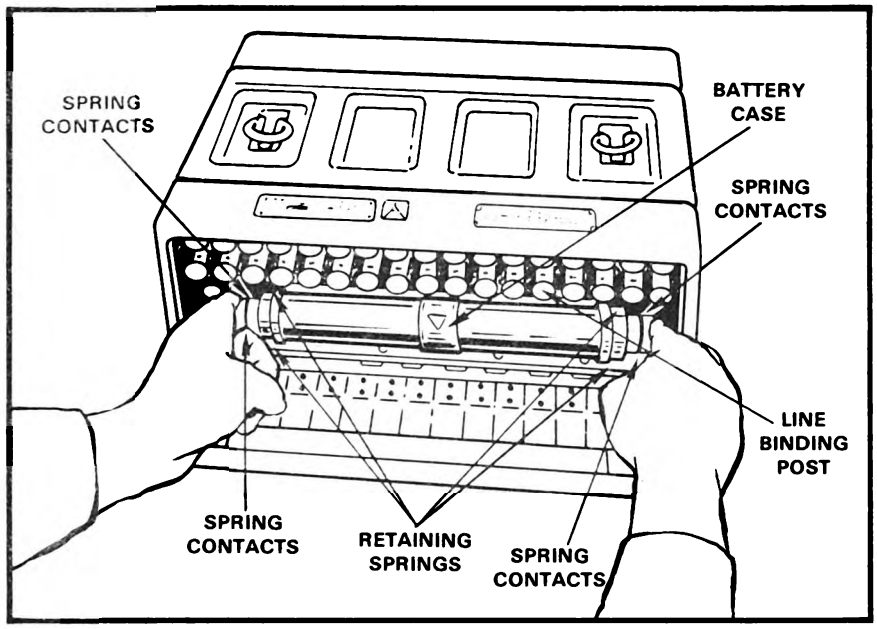

Figure 1. Battery case.

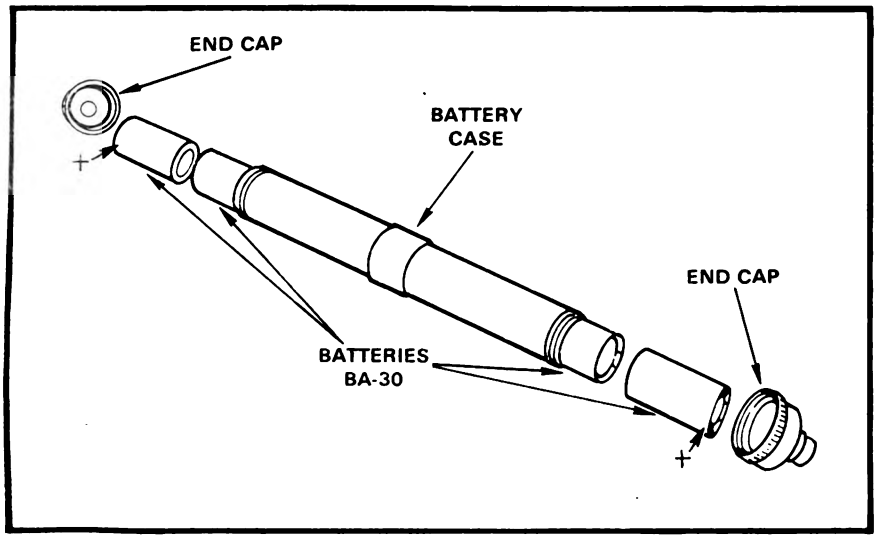

Figure 2. Installation of batteries in battery case.

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e. Operation of the SB-22/PT (figure 3).

(1) Place headbar over your head so receiver covers one ear, and aline the connector on the operator's telephone set cord with receptacle on the operator's pack. Push in on connector and turn it to the right to lock it in place.

(2) Insert the plug of operator's cord into operator's jack and operate the push-to-talk switch.

(3) Answering incoming calls:

(a) The line signal light will come on, followed by an audible signal.

(b) Place the operator plug in the calling party's line jack.

(c) After answering incoming call, place the calling party's line plug into the to-be-called party's line jack.

(d) Ring the called party to notify him of an incoming call.

(e) A ring back is used to signal end of coversation. When this occurs, remove calling party line plug from called party's line jack.

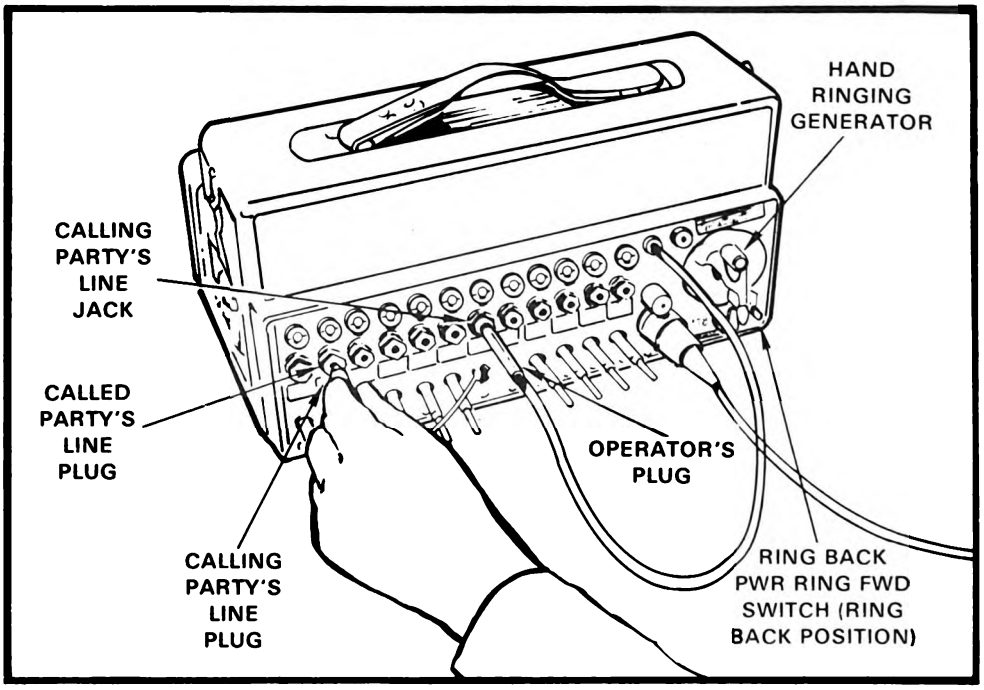
HAND RINGING GENERATOR
CALLING PARTY'S LINE JACK
CALLED PARTY'S LINE PLUG
OPERATOR'S PLUG
CALLING PARTY'S LINE PLUG
RING BACK PWR RING FWD SWITCH (RING BACK POSITION)

Figure 3.

REFERENCES:

FM 24-20, Field Wire and Field Cable Techniques, Feb 70 (chap 12, pages 248 thru 251, para 157)
TM 11-5805-262-12, Operator's and Organizational Maintenance Manual Switchboard, Telephone, Manual SB-22/PT and SB-22A/PT, C2, 4-6, Dec 60 (pages 23 thru 31, para 24 thru 37)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION VII
TACTICAL VEHICLES

TASK SUMMARIES

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TASK NUMBER: 071-333-6001

DRIVE A WHEELED VEHICLE CROSS-COUNTRY

CONDITIONS:

Given one of the following vehicles:

1. Truck utility ¼-ton M151, A1, A2.
2. Truck cargo 1¼-ton M715.
3. Truck cargo 1¼-ton M561.

The requirement to drive across varying terrain which includes the following obstacles:

1. More than 30% side slope.
2. 60% or less grade.
3. 30% or less side slope.
4. More than 60% grade.
5. Extremely sandy or muddy terrain.

STANDARDS:

Bypass all obstacles where possible, negotiate obstacles 2, 3, and 5 when they cannot be bypassed, and inform the vehicle commander and follow his instructions when obstacles 1 and 4 are encountered and cannot be bypassed.

PERFORMANCE MEASURES:

Operation of the transmission and transfer case. (See figures 1, 2, and 3.)

1. Shifting the M151 from 2-wheel drive. If the vehicle is moving, slow to a speed not exceeding 4 to 5 mph, depress the clutch, and shift the front axle drive lever to the forward (IN) position. The M151 automatically goes into low range upon engagement of the front axle drive (figure 1).

2. Shifting the M151 from 4-wheel to 2-wheel drive. If the vehicle is moving, slow to a speed not exceeding 4 to 5 mph, depress the clutch, and shift the front axle lever to the rear (OUT) position (figure 1).

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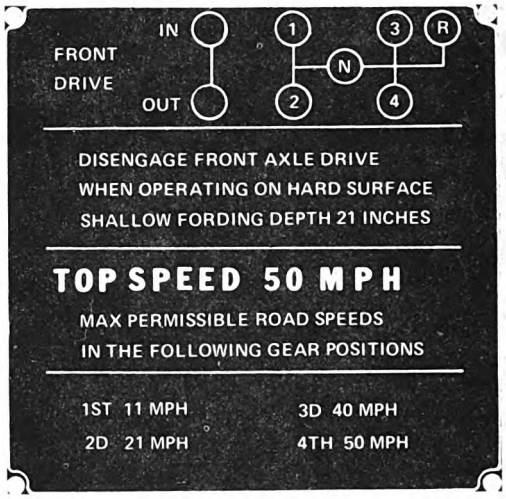

Figure 1. M151 Series.

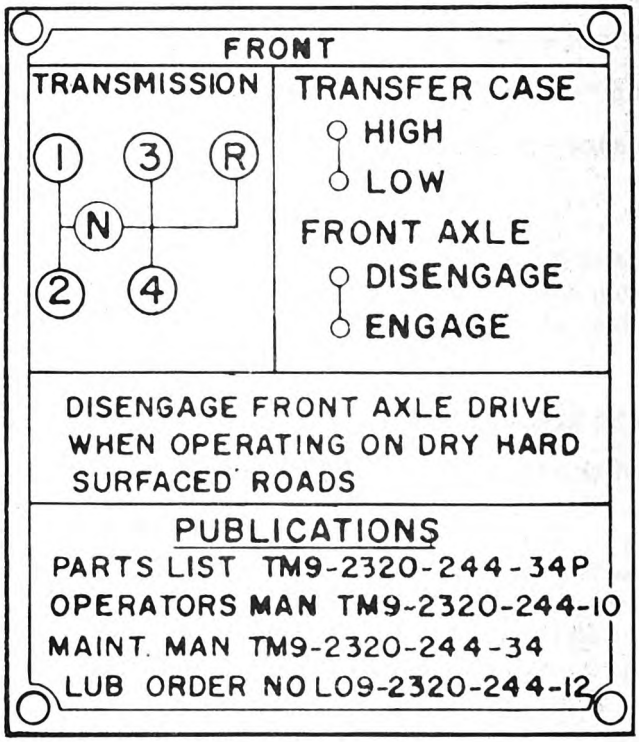

Figure 2. M715 Series.

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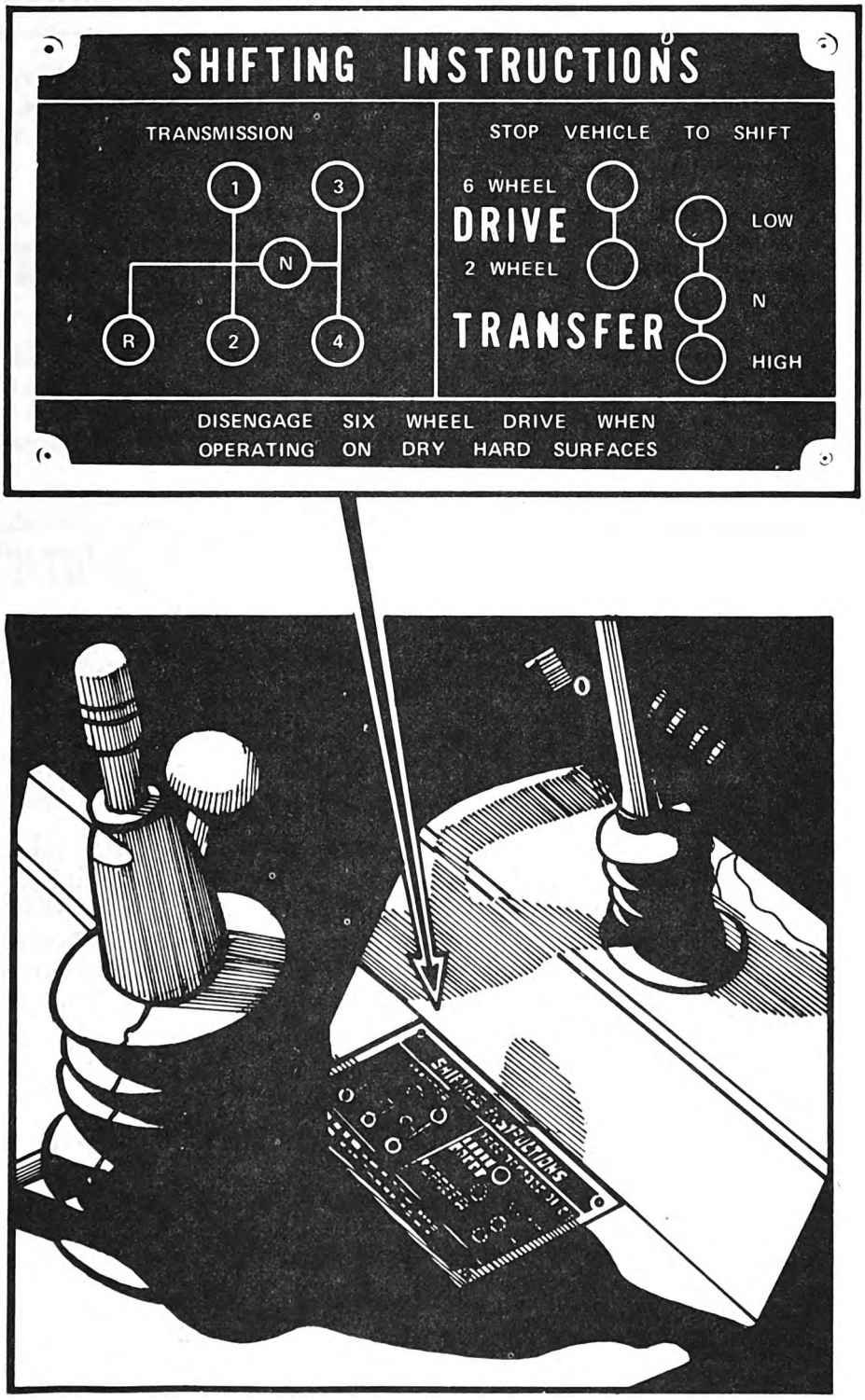

Figure 3. M561.

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3. Shifting the M715 from 2-wheel drive to 4-wheel drive. Let up on the accelerator if the vehicle is moving, depress the clutch, and shift the front axle drive lever to the rear (ENGAGE) position (figure 2).

4. Shifting the M715 from 4-wheel drive high range to 4-wheel drive low range. Slow the vehicle to a speed not exceeding 4 to 5 mph, depress the clutch, and move the auxiliary range lever to the rear (LOW) position (figure 2).

5. Shifting the M715 from 4-wheel drive low range to 4-wheel drive high range. Slow the vehicle to a speed not exceeding 4 to 5 mph, depress the clutch, and move the auxiliary range lever to the forward (HIGH) position (figure 2).

6. Shifting the M715 from 4-wheel drive to 2-wheel drive. Let up on the accelerator if the vehicle is moving, depress the clutch, and shift the front axle drive lever to the forward (HIGH) position. The auxiliary range lever must be in the forward (HIGH) position before the front axle drive can be disengaged (figure 2).

7. Shifting the M561 from 2-wheel to 6-wheel drive. Stop the vehicle, depress the clutch, and move the range selector lever to the forward (6-wheel) position (figure 3).

8. Shifting the M561 from 6-wheel drive high range to 6-wheel drive low range. Stop the vehicle, depress the clutch, and move the range selector lever to the forward (LOW) position (figure 3).

9. Shifting the M561 from 6-wheel drive low range to 6-wheel drive high range. Slow the vehicle to a speed not exceeding 4 to 5 mph, depress the clutch, and move the selector lever to the rear (HIGH) position (figure 3).

10. Shifting the M561 from 6-wheel drive to 2-wheel drive. If the vehicle is in high range, slow to a speed not exceeding 4 to 5 mph, depress the clutch, and move the selector lever to the rear (2-wheel) position. If the vehicle is in low range, stop, depress the clutch, and move the selector lever to the rear (2-wheel) position. Shifting from 4-wheel to 2-wheel drive will automatically place the vehicle in high range. Do not attempt to operate the vehicle in 2-wheel drive low range.

REFERENCES:

TM 9-2320-218-10, Operator's Manual (M151) (chap 2, page 2-76 thru 2-80, para 2-24)
TM 9-2320-242-10, Operator's Manual (M561) (chap 1, page 1-23, para 1-6a(6))
TM 9-2320-244-10, Operator's Manual (M715) (page 31-32)
DA Pam 750-31, The M561 Gamma Goat, Nov 70
TEC Lesson 944-441-0012-F thru 0018-F
TEC Lesson 944-441-0019-F, Gamma Goat: 5 Wheel Operation
TEC Lesson 944-441-0020-F, Gamma Goat: Operation Under Unusual Conditions

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TASK NUMBER: 071-333-6002

DRIVE A WHEELED VEHICLE ON ROADS, IN VEHICLE PARKS, AND IN BUILT-UP AREAS

CONDITIONS:

Given one of the following vehicles, and a requirement to drive on roads, in vehicle parks, and in built-up areas.

1. Truck utility ¼-ton M151, A1, A2.
2. Truck cargo 1¼-ton M715.
3. Truck cargo 1¼-ton M561.

STANDARDS:

The individual will operate the vehicle IAW local traffic regulations, the rules of the road, and safety factors outlined in the unit SOP, TM 21-300, TM 21-305, AR 385-10, and AR 385-55.

PERFORMANCE MEASURES:

1. The unit SOP will provide information on vehicle operation, to include references to appropriate local regulations. Additional background and Army-wide operating procedures, as well as the most important international traffic signs, are given in references cited below.

2. Traffic controls such as signs, signals, devices, and markings are explained in TM 21-300, sec V, para 42, and in TM 21-305, chap 10.

3. The rules of the road are explained in TM 21-300, sec V, para 43, and in TM 21-305, chap 6,7,8,9 and 11.

4. Safety is discussed in TM 21-300, sec VI, para 44. Additional safety requirements are outlined in AR 385-10 and AR 385-55.

REFERENCES:

AR 385-10, Army Safety Program (chap 2, page 2-1, para 2-1 thru 2-3)
AR 385-55, Prevention of Motor Vehicle Accidents (chap 2, page 2-0, para 3-1)
FM 21-305, Manual for the Wheeled Vehicle Driver (chap 6, page 6-1 thru 6-5, para 6-1 thru 6-8)
TM 21-300, Driver Selection and Training (Wheeled Vehicles) (chap 3, page 6, para 11; chap 4, page 12 thru 25, para 17 thru 39)

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TASK NUMBER: 071-333-6003

DRIVE A WHEELED VEHICLE USING BLACKOUT DRIVE

CONDITIONS:

During darkness, given one of the vehicles listed below with operative blackout drive and a requirement to drive over varied terrain which consists of slopes, trenches, streams, etc.

1. Truck utility ¼-ton M151, A1, A2.
2. Truck cargo 1¼-ton M715.
3. Truck cargo 1¼-ton M561.

STANDARDS:

The individual will negotiate the natural obstacles by using blackout drive on command.

PERFORMANCE MEASURES:

Blackout Night Driving (figures 1 thru 3).

1. Hold lock lever in UNLOCK position, turn main lever to BO DRIVE position, and then release lock lever.

2. The blackout headlight, the blackout marker lights, and the blackout bulbs in each taillight will come on. The blackout stoplight will come on when the brake pedal is depressed (figures 1 and 2).

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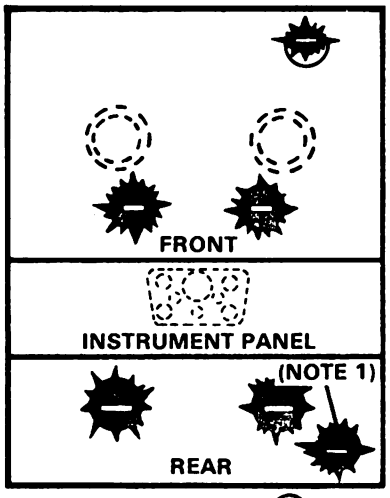
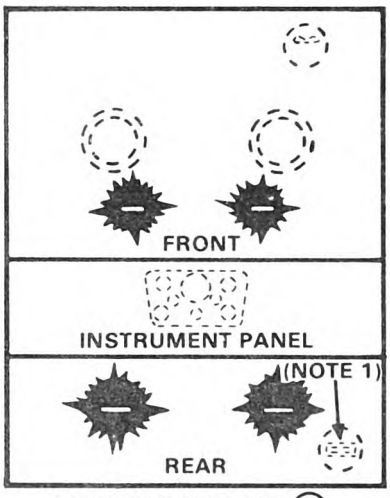
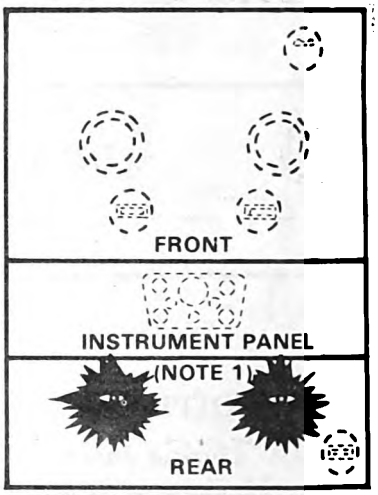


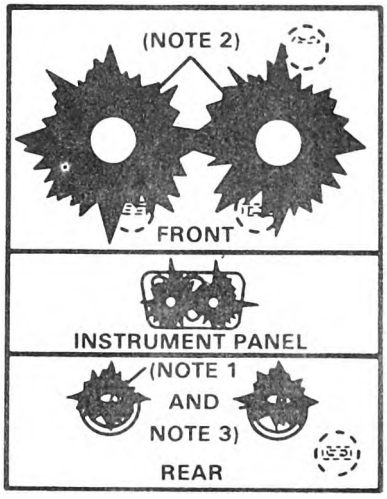
BLACKOUT DRIVE (A)



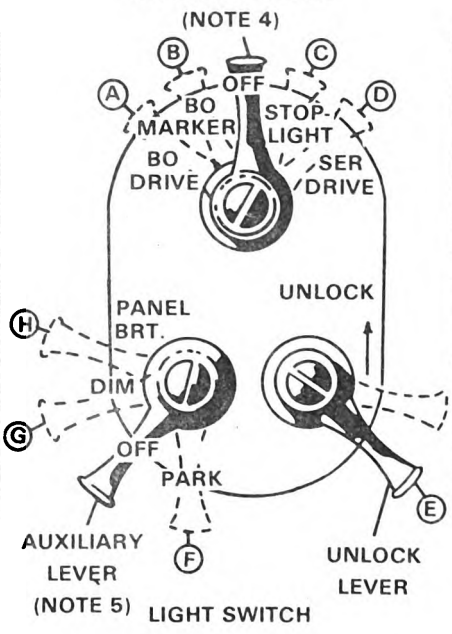
BLACKOUT MARKER (B)

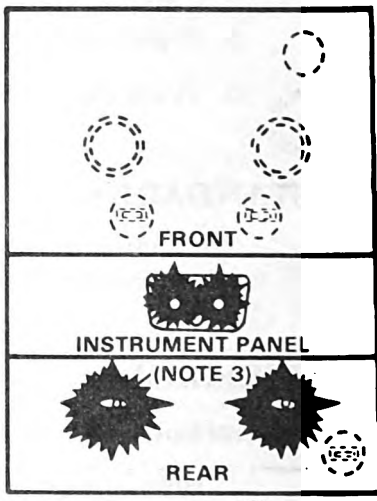


STOPLIGHTS FOR DAYTIME DRIVING (C)



SERVICE DRIVE (NORMAL NIGHTTIME DRIVING (D) AND INSTRUMENT PANEL LIGHTS DIM (G)





SERVICE DRIVE (D) WITH AUXILIARY LEVER IN PARK (F) (NORMAL NIGHTTIME PARKING)

NOTE 1. STOPLIGHT GOES ON WHEN BRAKES ARE APPLIED.

NOTE 2. DIMMER SWITCH OPERATES HIGH AND LOW BEAM OF HEADLIGHTS WHEN IN SERVICE DRIVE (D).

NOTE 3. TAILLIGHT GOES ON.

NOTE 4. TO PLACE SELECTOR LEVER IN BLACKOUT DRIVE (A), STOPLIGHT (C), OR SERVICE DRIVE (D), UNLOCK LEVER (E) MUST BE LIFTED TO UNLOCK POSITION. NO LIGHTS OPERATE WHEN SELECTOR LEVER IS IN OFF POSITION.

NOTE 5. INSTRUMENT PANEL LIGHTS ARE BRIGHT IN PANEL BRT (H) POSITION. THE AUXILIARY LEVER CAN BE OPERATED AT ANYTIME IN ANY POSITION.

Figure 1.

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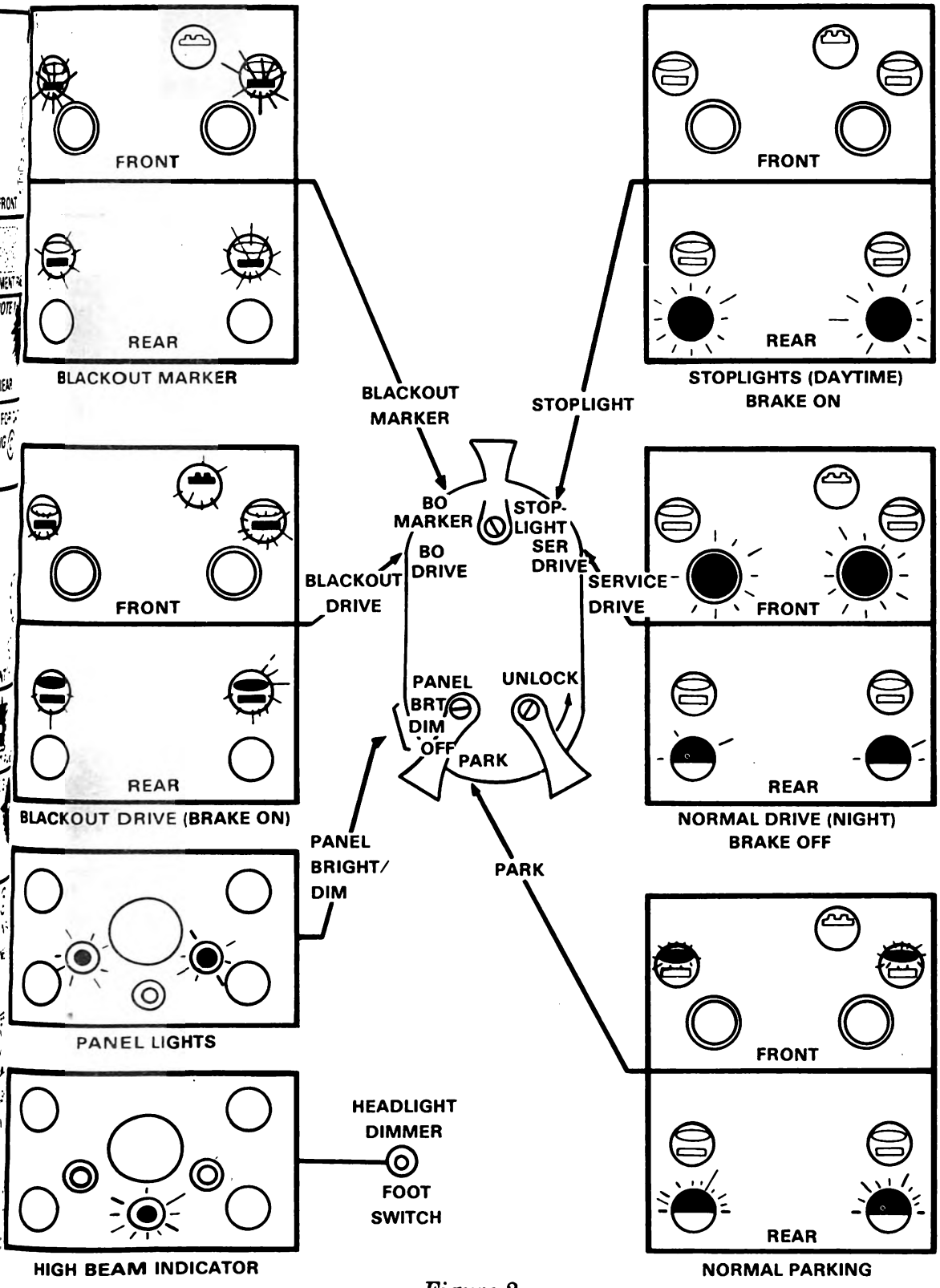

Figure 2.

2-VII-A-3.3

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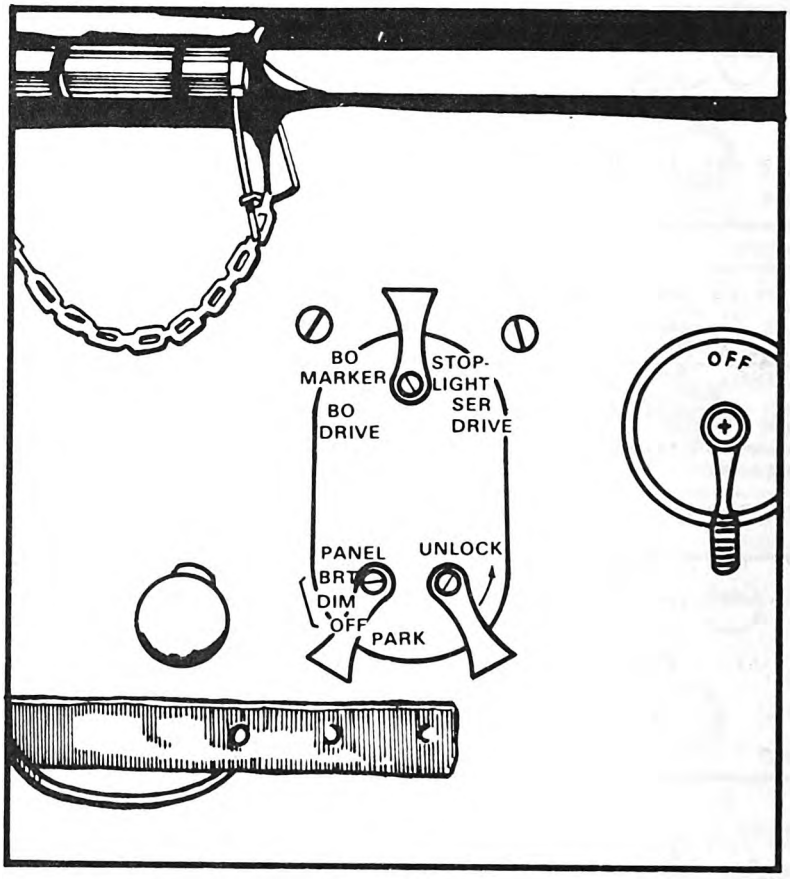

Figure 3.

REFERENCES:

TM 9-2320-218-10, Operator's Manual (M151), C1, Nov 72 (chap 2, page 2-24 and 2-25)
TM 9-2320-242-10, Operator's Manual (M561), Mar 70 (chap 2, sec III, page 2-22 thru 2-24, para 2-5 thru 2-6a(1-11))
TM 9-2320-244-10, Operator's Manual (M715), C1, Aug 68 (page 13 thru 14)

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TASK NUMBER: 071-333-6004

START A WHEELED-VEHICLE ENGINE USING AUXILIARY POWER (M151, M715, M561)

CONDITIONS:

Given two wheeled vehicles (one operative and one with a dead battery) and an auxiliary power cable.

STANDARDS:

Start the engine of the vehicle with the dead battery, using an auxiliary power cable, without damaging either vehicle.

PERFORMANCE MEASURES:

1. The auxiliary power cable receptacle, located as shown in figures 1 through 3, provides for use of 24-volt power from an outside source to start the engine, charge batteries, or operate electrical equipment.

2. To start the engine:

a. Turn the ignition switch (master switch on M561) OFF before connecting auxiliary power cable.

b. Unscrew protective cap from the slave receptacle.

c. Connect auxiliary cable from external power source to receptacle.

CAUTION: Make certain prongs of auxiliary power source correspond to holes of vehicle electrical system, as marked on slave receptacle (- to -, + to +).

d. Turn ignition switch (master switch on M561) ON, and start engine in normal manner.

e. Disconnect auxiliary power cable after engine starts.

f. Install protective cap on receptacle.

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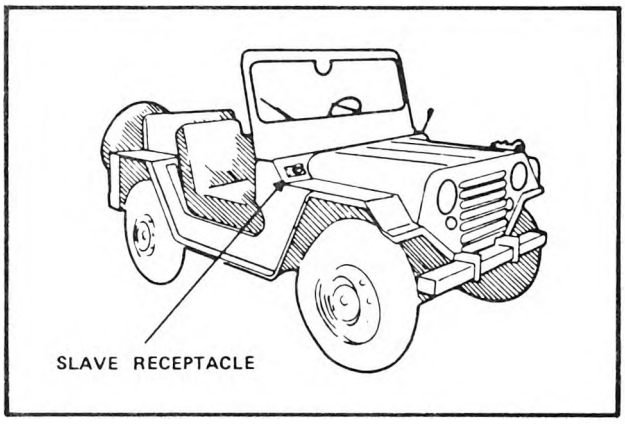

Figure 1.

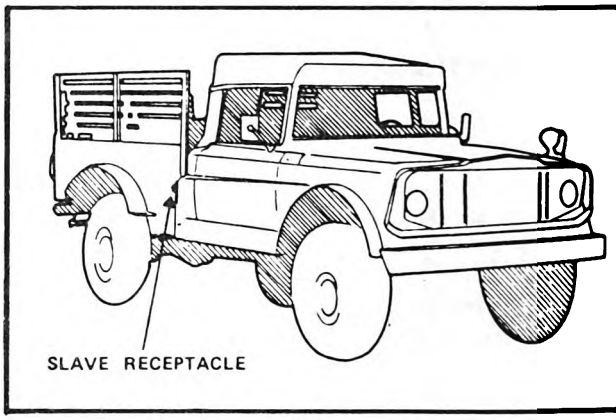

Figure 2.

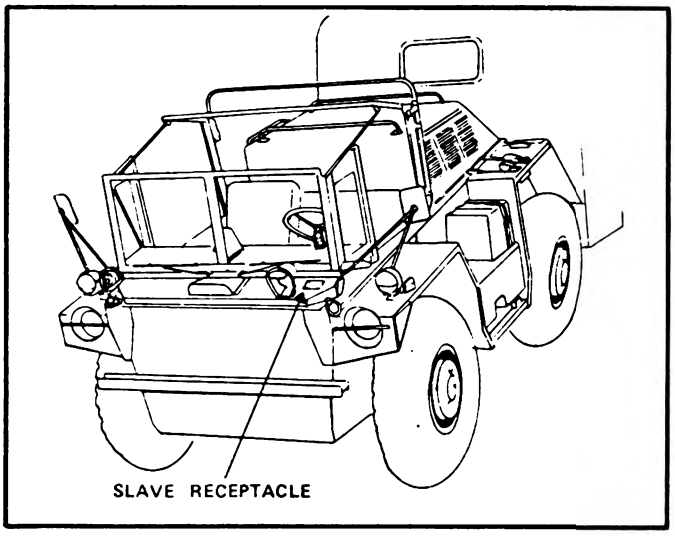

Figure 3.

REFERENCES:

TM 9-2320-218-10, Operator's Manual (151), Sep 71 (chap 2, page 2-41)
TM 9-2320-242-10, Operator's Manual (M561), Mar 70 (chap 2, sec IV, pages 2-39 thru 2-40, para 2-14)
TM 9-2320-244-10, Operator's Manual (M715), C1, Aug 68 (page 31)

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TASK NUMBER: 071-333-6005

PERFORM AN ESC (EQUIPMENT SERVICEABILITY CRITERIA) INSPECTION ON A WHEELED VEHICLE (M151, M715, and M561)

CONDITIONS:

Given one of the vehicles listed below, appropriate tools, logbook, ESC TM, -10TM (Operator's Manual), pencil/pen, and the required number of DA form 2404's.

1. Truck utility ¼-ton M151, A1, A2.
2. Truck cargo 1¼-ton M715.
3. Truck cargo 1¼-ton M561.

STANDARDS:

Within 2 hours, the vehicle operator will:

1. Perform an ESC inspection on all subsystems of the vehicle.
2. Determine and record on the appropriate DA Form 2404 the correct color rating for each component and subsystem.
3. Assign the lowest subsystem rating to the overall system evaluation.

PERFORMANCE MEASURES:

The conduct of the evaluation is prescribed in the TM for ESC. The correct method of recording the results is also explained in the TM for ESC, and in appendix E of TM 38-750. A lubrication order may assist individuals in locating components.

REFERENCES:

TM 38-750, The Army Maintenance Management System (TAMMS), Nov 72 (App E)
TM 9-2320-218-ESC, M151, Oct 72
TM 9-2320-242-ESC, M561, Jun 73
TM 9-2320-244-ESC, M715, Jul 73

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TASK NUMBER: 071-333-6006

MAINTAIN REQUIRED TAMMS RECORDS ON A WHEELED VEHICLE (M151, M715, and M561)

CONDITIONS:

Given DA Form 2404, a vehicle logbook, TM 38-750, and specific information pertaining to a vehicle.

STANDARDS:

The individual will:

1. Complete operator entries on the DA Form 2404 IAW TM 38-750.

2. Complete operator entires on the DA Form 2408-1 (Daily) IAW TM 38-750.

3. Compare any faults (shortcomings) given as pertaining to the vehicle with those listed on the 2408-14 to determine if they have been previously identified and corrective action was taken.

4. Extract data pertaining to unapplied modifications for the vehicle from the DA Form 2408-5.

5. Extract data pertaining to component miles/hours from the DA Form 2408-10 and DA Form 2408-1 (Daily).

PERFORMANCE MEASURES:

1. DA Form 2404 is prepared IAW procedures outlined in paragraph 3-4 of TM 38-750.

2. DA Form 2408-1 (Daily) is prepared IAW procedures outlined in paragraph 4-5 of TM 38-750.

3. DA Form 2408-5 is prepared IAW procedures outlined in paragraph 4-8 of TM 38-750.

4. DA Form 2408-10 is prepared IAW procedures outlined in paragraph 4-10 of TM 38-750.

5. DA Form 2408-14 is prepared IAW procedures outlined in paragraph 4-13 of TM 38-750.

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REFERENCES:

FM 38-750, The Army Maintenance Management System (TAMMS), C1, Nov 72 (chap 4, page 4-36 & 4-37, para 4-20)
TEC Lesson 510-091-6457-F, Preparing and Using DA Form 2404 Part 1
TEC Lesson 510-091-6458-F, Preparing and Using DA Form 2404 Part 2
TEC Lesson 510-091-6474-F, Preparing, Maintaining and Using DA Form 2408-1
TEC Lesson 510-091-6478-F, Preparing, Maintaining and Using DA Form 2408-5
TEC Lesson 510-091-6477-F, Preparing, Maintaining and Using DA Form 2408-10

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TASK NUMBER: 071-333-6007

PERFORM OPERATOR MAINTENANCE ON A WHEELED VEHICLE

CONDITIONS:

Given one of the vehicles listed below, basic issue items, an operator's TM for the vehicle, a lubrication order for the vehicle, the vehicle logbook, TM 38-750, and a DA Form 2404.

1. Truck utility ¼-ton M151A1, A2
2. Truck cargo 1¼-ton M715
3. Truck cargo 1¼-ton M561

STANDARDS:

The individual will:

1. Perform before-, during-, and after-operation maintenance on the vehicle IAW instructions in the -10 TM.

2. Identify maintenance deficiencies/shortcomings and correct those within the operator's capability.

3. Cross-reference uncorrectable faults against the DA Form 2408-14.

4. Prepare a DA Form 2404 to notify organizational maintenance of previously unreported uncorrectable faults or repairs which require a part.

5. Lubricate the vehicle IAW the lubrication order.

6. Perform troubleshooting procedures on the vehicle IAW the appropriate TM.

PERFORMANCE MEASURES:

1. Operator maintenance follows procedures outlined in the preventive maintenance services section of the appropriate TM.

2. To correct deficiencies/shortcomings, refer to the appropriate TM.

3. Previously reported faults beyond the operator's capability to repair or those requiring parts are recorded on the Uncorrected Fault Record (DA Form 2408-14) in the vehicle logbook. This form is completed by organizational maintenance IAW procedures outlined in paragraph 4-13 or TM 38-750.

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4. Faults which the operator cannot correct or which require a part are recorded on DA Form 2404 IAW procedures outlined in paragraph 3-4 of TM 38-750.

5. The vehicle is lubricated IAW the instructions in the lubrication order.

6. Troubleshooting procedures are outlined in the troubleshooting section of the appropriate TM.

REFERENCES:

TM 9-2320-218-10, Operator's Manual (M151), C1, Sep 71 (chap 3, pages 3-11 thru 3-24, para 3-7)
TM 9-2320-242-10, Operator's Manual (M561), C2, Mar 70 (chap 3, pages 3-11 thru 3-13 (page 23-25 of C2)) (for LO, see page 8 thru 12 of C2)
TM 9-2320-244-10, Operator's Manual (M715), C1, Aug 68 (pages 35, 36, 55 thru 59)
TM 38-750, The Army Maintenance Management System, C1, Nov 72 (chap 3, page 3-4, para 3-4)
LO 9-2320-244-10, Lubrication Order (M715) Aug 73
TEC Lesson 041-091-6486-F (TBP)
TEC Lesson 510-091-6458-F (TBP)
TEC Lesson 944-441-0001, 2, and 3F (TBP)

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TASK NUMBER: 071-333-6008

RECOVER A WHEELED VEHICLE

CONDITIONS:

During combat or training under all type weather conditions, given a wheeled vehicle requiring recovery (the vehicle is equipped with basic issue items), either applicable materials for expedient recovery or a similar vehicle, and one or more assistant drivers.

STANDARDS:

Recover the disabled wheeled vehicle using one of the following:

1. Similar vehicles if available for recovery.
2. Vehicle's basic issue items for self-recovery.
3. One of the following expedient methods:
   a. Prying.
   b. Use disabled vehicle wheels for winching.
   c. Use an A-frame.

PERFORMANCE MEASURES:

1. **Methods of Recovery.** There are four methods of recovery that are performed using organizational personnel and equipment.

a. Winching. Operations performed using winches on special purpose vehicles or cargo type vehicles.

b. Towing. Operations performed using towing capabilities of similar or special purpose vehicles. This is the quickest recovery method.

c. Lifting. Operations performed using special purpose vehicles.

d. Expedients. Used when other methods are not adaptable to the situation or when additional vehicles and equipment are not readily available.

2. **Levels of Recovery.** Recovery operations performed within an organization are divided into levels based on personnel who perform the operations and equipment available to them.

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a. Platoon Level. Recovery performed by vehicle drivers and crews, under supervision of squad, section, or platoon leader. At this level, winching, towing, and expedient methods of recovery are employed, using platoon vehicles and equipment.

b. Company and Battalion Levels. Recovery performed by general vehicle repairmen or recovery specialists under the supervision of the recovery chief, using winching, towing, and lifting methods of recovery with special purpose vehicles. Because of the increased number of special purpose vehicles at battalion level, a greater recovery capability exists than at company level.

3. **Recovery Procedure.** During any recovery operation, a proven procedure should be used to insure quick and safe accomplishment. A haphazard approach to a recovery problem or the trial and error method can only result in a prolonged immobility of the disabled vehicle, loss of valuable time, damage to equipment, and possible injury to personnel. The following eight-step recovery procedure, in the proper sequence, should be used in any recovery involving winching.

RECOVERY PROCEDURE

RECONNOITER AREA

ESTIMATE SITUATION

CALCULATE RATIO

OBTAIN RESISTANCE

VERIFY SOLUTION

ERECT RIGGING

RECHECK RIGGING

YOU ARE READY

4. **Vehicle Recovery Operations (Similar Vehicles).** The amount and type equipment employed as the source of effort during any recovery operation is dependent upon the level of recovery as discussed in paragraph 2. Every effort should be made by the drivers and crews to accomplish the recovery before calling on support from a higher level. During combat, it may be of the utmost importance that cargo reach its destination at a definite time, or that personnel or cargo be picked up at a given time, or that a combat vehicle be at a given place at a specific time. The use of similar vehicles for recovery usually constitutes the QUICKEST METHOD of recovery because similar vehicles are readily available. Recovery support should be called upon only when the similar vehicles are not adaptable to the situation or when the tactical situation does not permit their use. Engaged combat vehicles should never be diverted for the purpose of recovery.

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5. **Use of Similar-Type Wheeled Vehicles for Recovery.** Similar wheeled vehicles can be used as the source of effort to perform recovery by towing and winching.

a. To recover a mired truck by towing with a similar vehicle, a tow chain should be used between the towing and the mired vehicle, attached to one of the lifting shackles of the mired vehicle and a front lifting shackle on the towing vehicle. If a greater working distance is required to enable the towing vehicle to get better traction, then the tow chains from both vehicles should be used. Power must be applied slowly to prevent placing an impact on the chain and lifting shackles. A chain, unlike a cable, will not stretch and can easily be broken by impact. If one towing vehicle cannot attain sufficient towing effort to overcome the resistance, another towing vehicle can be used in tandem with the first (figure 1).

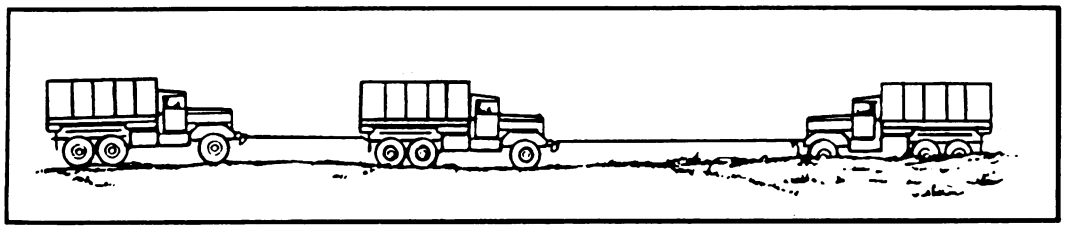

Figure 1. Towing a cargo truck from mire.

b. To recover a mired cargo truck by winching, a truck of equal or greater capacity should be used to perform the winching operation. As an example, a mired 1¼-ton cargo truck may be winched with either a 1¼-ton or 2½-ton vehicle. All winch-equipped trucks are authorized a single sheave snatch block and one tow chain for rigging. A mechanical advantage is required if the resistance of the mired truck is greater than the winch capacity. The winching vehicle must be positioned in line with the mired vehicle so the correct fleet angle is obtained. The winch cable must be free-spooled from the drum and the free end of the cable attached to one of the winching vehicle's front lifting shackles or to a separate anchor. A chain sling is formed between the lifting shackles of the mired vehicle and the snatch block is attached in the apex of the sling. The loop formed in the winch cable is placed in the snatch block and power is applied to the winch to remove the slack from the cable (figure 2).

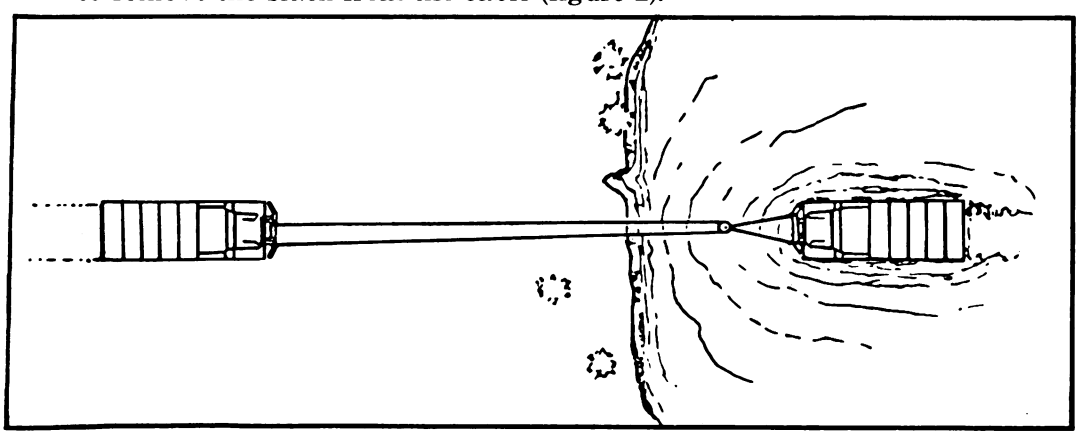

Figure 2. Winching with a similar vehicle.

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c. A winch-equipped mired vehicle can perform a self-recovery. The rigging is similar to that used for similar vehicle recovery except the snatch block is attached to a suitable anchor and the free end of the cable attached to one of the mired vehicle's front lifting shackles. A fixed block will gain a mechanical advantage on a self-winching operation even though the sheave of the block is performing as a first-class lever because the source of effort (the winch) is part of the load; therefore, both the fall line and return line are attached to the load and supporting it. Since there are two lines supporting the load, a 2 to 1 mechanical advantage is obtained (figure 3).

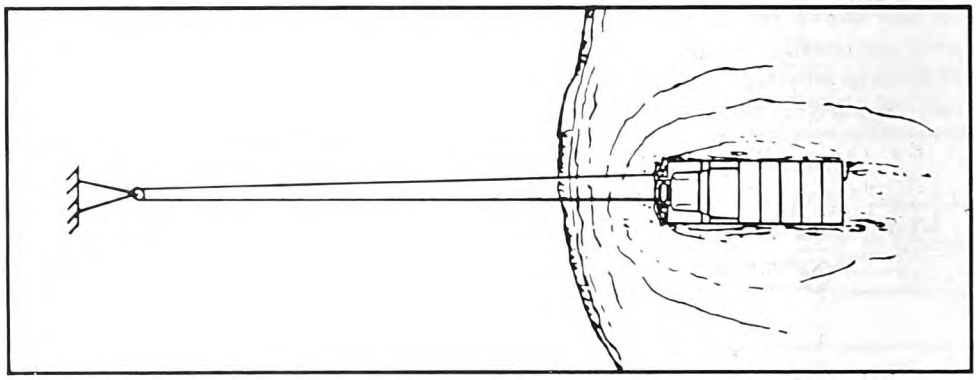

Figure 3. Self-winching operation.

6. **Recovery Expedients.** Military operations will require vehicles to operate in remote areas where, should disablement occur, assistance would not be readily available. Under these conditions, the driver or crew must attempt self-recovery by the use of expedients. An expedient is an improvised method and is accomplished with the materials on hand.

a. Use of a Pry. A pole can be used to pry a ¼-ton truck out of a ditch by lifting the front end of the truck with the pole as illustrated in figure 4, and applying power to the truck in reverse gear.

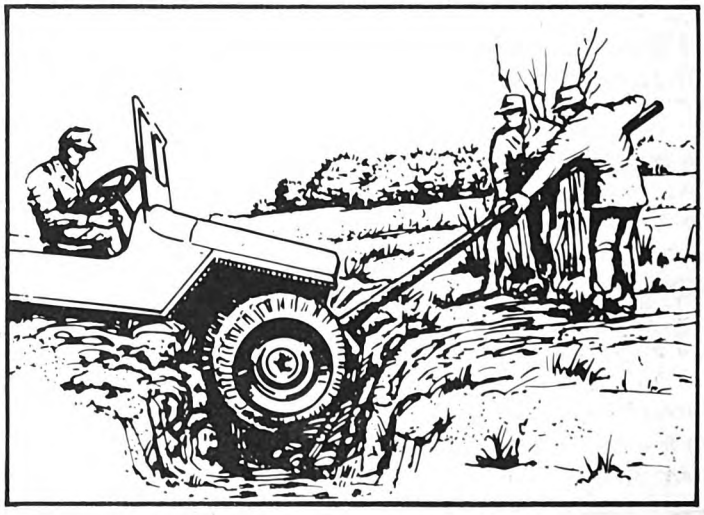

Figure 4. Pole used as a pry.

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b. Use of Wheels for Winching. On wheeled vehicles not equipped with a winch, the rear wheels may be used to assist in recovering the vehicle. On a dual-wheeled truck, a rope with one end fastened to the wheel hub and the other end anchored, will cause the rope to be wound between the dual wheels providing the same action as a winch. The end of the rope that is fastened to the wheels should be run between the duals and through one of the holes in the wheel disk. Care should be taken not to place the rope through a hole in the wheel disk where the valve stem is located. A bowline knot is tied in the end of the rope and slipped over the hub. Tie a second rope in the same manner to the dual wheels on the other end of the axle, then place the vehicle in reverse gear; the ropes will wind between the two duals, causing the vehicle to move rearward. If the truck has single wheels, such as the M715 and M151, the same expedient can be used by placing a bar through the hole in the end of the axle flange. A rope is attached to the wheels on each side of the vehicle by fastening them to the bars with figure 8 hitches (figure 5). Applying power will cause the ropes to be wound around the hubs and move the vehicle.

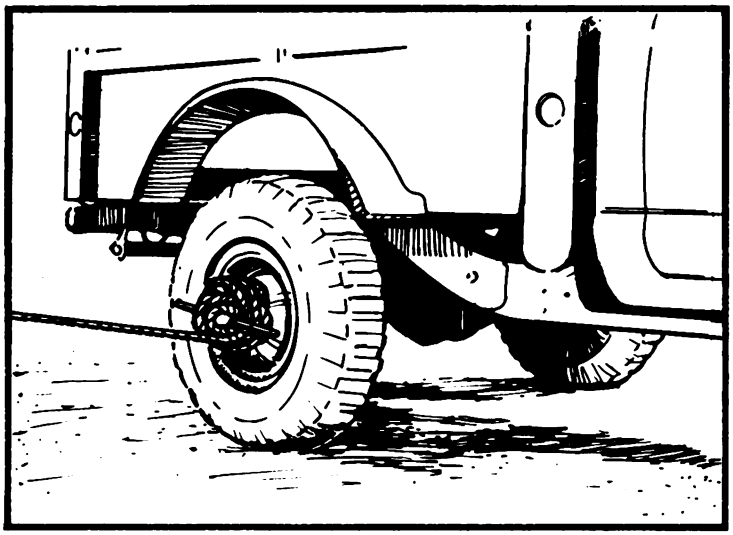

Figure 5. Attachment of rope to single wheels to be used as a winch.

c. Use of an A-Frame. Frequently, a truck will become nosed in a shell hole or narrow ditch. When a truck becomes disabled in this manner, both lifting and pulling forces are required to make the recovery. The lifting force can be obtained from an A-frame. To construct an A-frame, two poles approximately 8 feet long and large enough in diameter to support the front end of the truck will be needed. The poles should be lashed together at the top by a figure 8 or girth hitch (figure 6). The lower end of the poles should be placed in the ground 10 to 12 inches deep to prevent them from sliding when power is applied. The upper end of the A-frame is laid across the hood of the vehicle and the attachment made as in figure 7. If the nose truck is equipped with a winch, the winch cable should be rigged for a 2 to 1 mechanical advantage, with the end of the cable secured to the apex of the A-frame.

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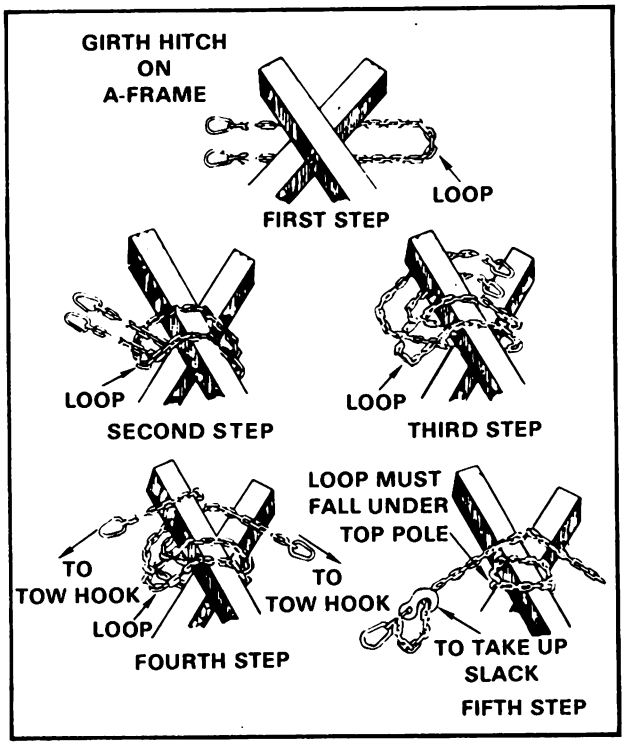

Figure 6. Tying girth hitch to A-frame.

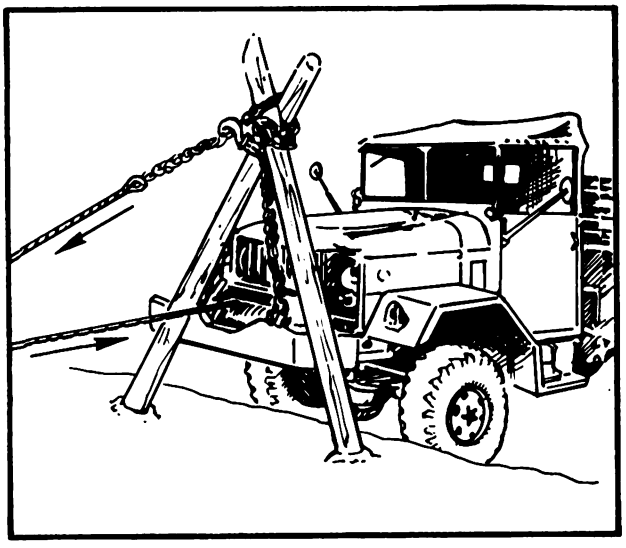

Figure 7. Recovery of a nosed truck using an A-frame.

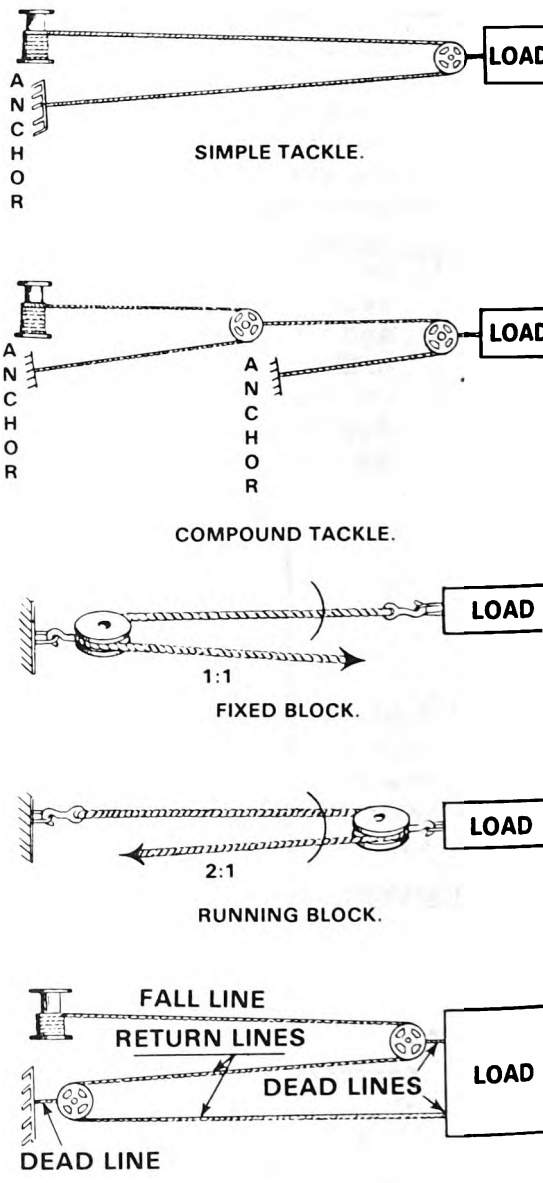

Table 1. Tackle terminology.

REFERENCES:

FM 5-34, Engineer Field Data, Sep 76 **(chap 16, page 367 thru 369, para 16-7)**
FM 20-22, Vehicle Recovery, Jul 70 **(chaps 5 and 6, pages 58 thru 108)**

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TASK NUMBER: 071-333-6501

DRIVE AN APC CROSS-COUNTRY

CONDITIONS:

Given an M113A1 personnel carrier during daylight, a vehicle commander, and a requirement to drive across varying terrain which includes the following obstacles:

1. More than 30% side slope.
2. 60% or less grade.
3. 24-inch vertical wall, or less.
4. Trench 5½ feet wide, or less.
5. 30% or less side slope.
6. More than 60% grade.
7. More than 24-inch vertical wall.
8. Trench more than 5½ feet wide.

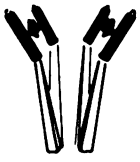
STANDARDS:

Bypass all obstacles where possible, negotiate obstacles 2, 3, 4, and 5 when they cannot be bypassed, and inform track commander and follow his instructions when obstacles 1, 6, 7, and 8 are encountered and cannot be bypassed.

PERFORMANCE MEASURES:

1. **Steering and stopping** (figure 1).

CAUTION: NEVER USE PIVOT STEER LEVERS AND DIFFERENTIAL STEER LEVERS AT THE SAME TIME OR DIFFERENTIAL MAY BE SEVERELY DAMAGED.

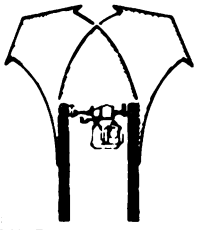


To slow vehicle, release accelerator pedal and pull back equally on both levers, using pumping movement. To stop vehicle quickly, release pedal and pull back equally on both levers, using hard, steady pull.

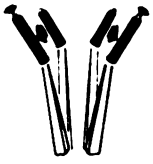
To turn left when traveling forward or in reverse, pull left lever until turn is complete, then release lever.

CAUTION
NEVER TOUCH LOCK BUTTONS ON TOP OF HAND GRIPS WHEN STEERING VEHICLE

NOTE
FOR NORMAL STOP, RELEASE ACCELERATOR PEDAL AND ALLOW VEHICLE TO COME TO A STOP SHIFT TO N AFTER VEHICLE STOPS



CAUTION
WHEN OPERATING IN LOOSE SAND, DIRT, OR ROCKS, ESPECIALLY ON SIDE SLOPES, STEER IN A SERIES OF SHORT TURNS, RATHER THAN ONE LONG EVEN TURN, TO ALLOW DEBRIS TO FEED OUT OF TRACK IF DEBRIS ACCUMULATES. DAMAGE TO SUSPENSION OR A THROWN TRACK MAY RESULT



To lock brakes for parking, pull both levers back tightly and depress lock button on top of hand grips. To release brakes, pull back on levers, keeping thumbs clear of lock button, then release levers.

To turn right when traveling forward or in reverse, pull right lever until turn is complete, then release lever.

Figure 1.

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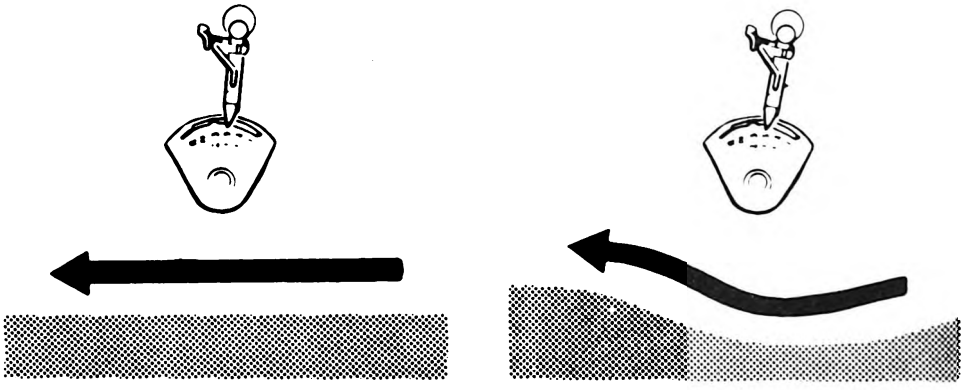
2. **Shifting.** Manual shifting is required to avoid excessive automatic shifting in the transmission or overloading the engine. The type of terrain encountered determines the range selection. The following general rules apply for proper range selection:

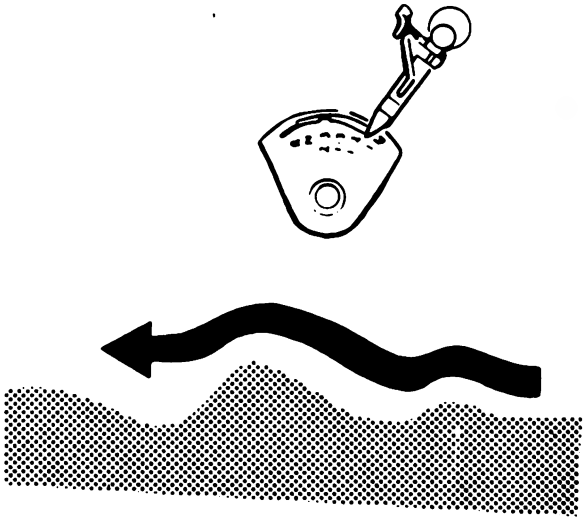
a. Level Terrain. Use 1-3 or 2-3 range for operation on level roads or hilly terrain when maximum speed is required and can be maintained without excessive automatic shifting (figure 2).



A. Roads and level terrain: 1—3 range. B. Hilly terrain: 1—3 range.

Figure 2.

b. Rough Terrain. Use 1-2 range for cross-country travel over rough terrain and when traveling up and down long gradual grades (figure 3).



Rough terrain and trenches: 1—2 range.

Figure 3.

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c. Steep Grades. Use 1 range for climbing and descending steep grades (figure 4) and 1-2 range for moderately steep grades (figure 3).

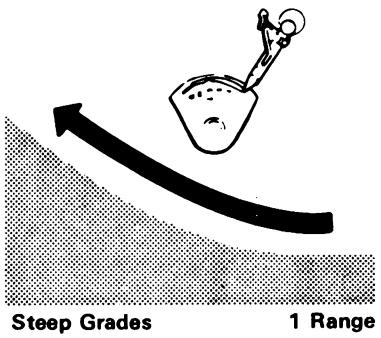

Figure 4.

3. **Performance on land.**

a. Maximum grade 60%

b. Maximum side slope 30%

c. Maximum vertical wall:

(1) Forward ..... 24″

(2) Reverse ..... 14″

d. Maximum trench ..... 5½′

REFERENCES:

TM 9-2300-257-10, Operator's Manual, Carrier, Personnel, Full Tracked, Armored, M113A1, Dec 73 (chap 2, sec III, page 2-79 thru 86)
TEC Lesson 945-171-0100-F, Varied Terrain Driving
TEC Lesson 945-171-0101-F, Reduced Traction and Hazards

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TASK NUMBER: 071-333-6502

DRIVE AN APC ON ROADS, IN VEHICLE PARKS, AND IN BUILT-UP AREAS

CONDITIONS:

Given an M113A1 and a requirement to drive on roads, in vehicle parks, and in built-up areas.

STANDARDS:

Operate the vehicle IAW local traffic regulations, the rules of the road, and safety factors outlined in the unit SOP, TM 21-301, TM 21-306, AR 385-10, and AR 385-55.

PERFORMANCE MEASURES:

1. The unit SOP will provide information on vehicle operation, to include references to appropriate local regulations. Additional background and Army-wide operating procedures, as well as the most important international traffic signs, are given in references cited below.

2. Traffic controls such as signs, signals, devices, and markings are explained in TM 21-301, chapter 10.

3. The rules of the road are explained in TM 21-305, chapters 6, 7, 8, 9, and 11.

4. Safety is discussed in TM 21-306, section II, paragraph 12. Additional safety requirements are outlined in AR 385-10 and AR 385-55.

REFERENCES:

AR 385-10, The Army Safety Program, C1 thru 4, Feb 70 (chap 2, page 2-1, para 2-1 thru 2-3)
AR 385-55, prevention of Motor Vehicle Accidents, Apr 74 (chap 2, page 2-1, para 2-1)
TM 21-301, Driver Selection, Training and Supervision, Tracked Vehicles, Jul 67 (chap 3, page 6, para 11; chap 4, page 12-25, para 17 thru 39)
TM 21-306, Manual for the Tracked Combat Vehicle Driver, C1, Aug 64 (chap 2, sec I thru V, page 3-49, para 6-31)

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TASK NUMBER: 071-333-6503

DRIVE AN APC WITH NIGHT VISION DEVICES, INFRARED EQUIPMENT, AND BLACKOUT DRIVE

CONDITIONS:

During darkness, given an M113A1 personnel carrier with operative blackout drive and an M19 infrared periscope, a vehicle commander, and a requirement to drive over varied terrain which consists of slopes, trenches, vertical walls, streams, etc.

STANDARDS:

The individual will negotiate the obstacles by:

1. Using blackout drive on command.
2. Installing and using M19 infrared periscope on command.

PERFORMANCE MEASURES:

1. **Blackout Night Driving** (figure 1).

a. Hold lock lever in UNLOCK position, turn main lever to B.O. DRIVE position, and then release lock lever.

b. The blackout headlight, the blackout marker lights, and the blackout bulbs in each taillight will come on. The blackout stoplight will come on when both steering levers are pulled to brake the carrier.

2. **Operating the M19 Infrared Periscope** (figure 2 thru 5).

a. When required for blackout driving, the M19 infrared periscope is installed in the driver's hatch and operated as shown in figures 3, 4, and 5.

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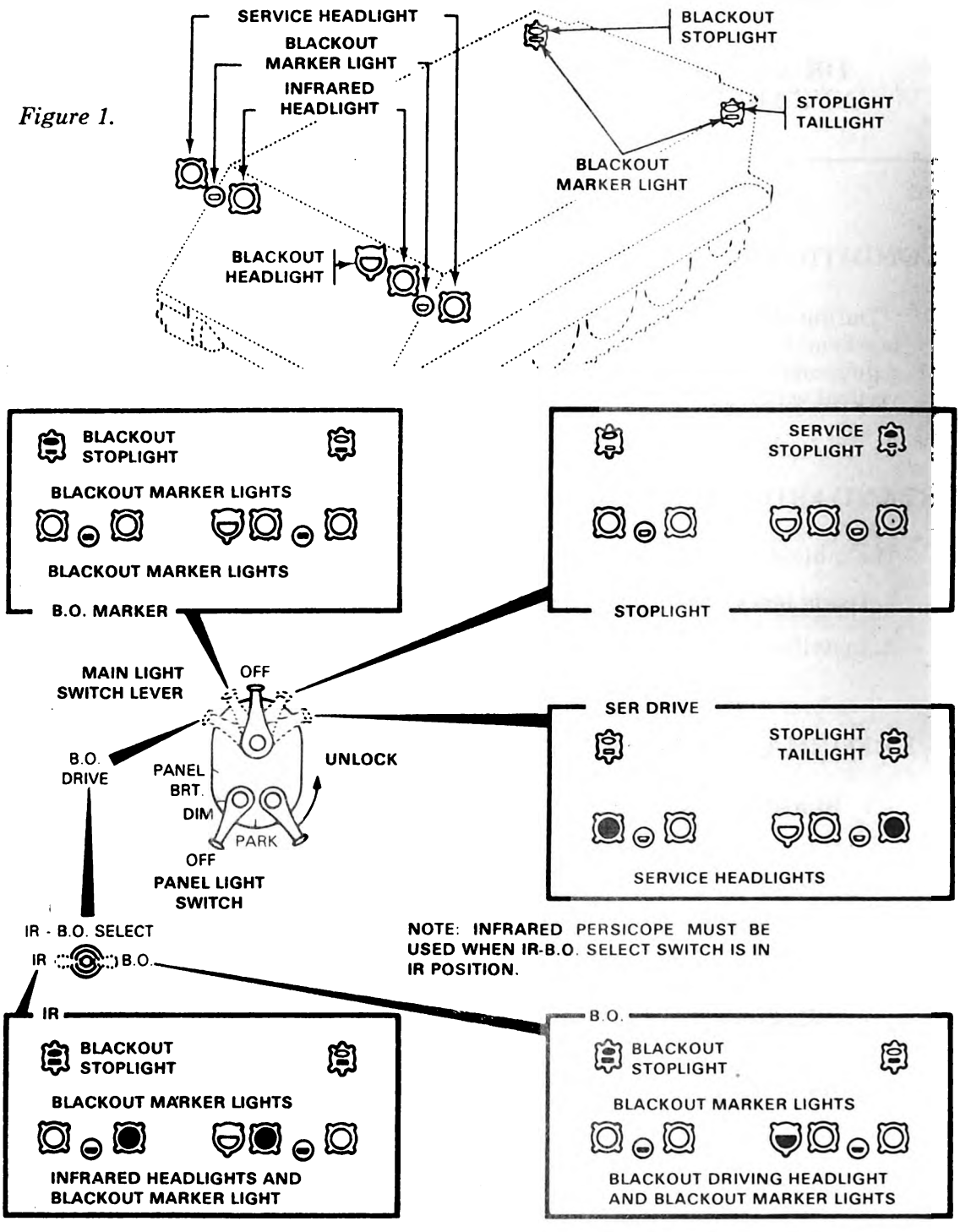
Figure 1.



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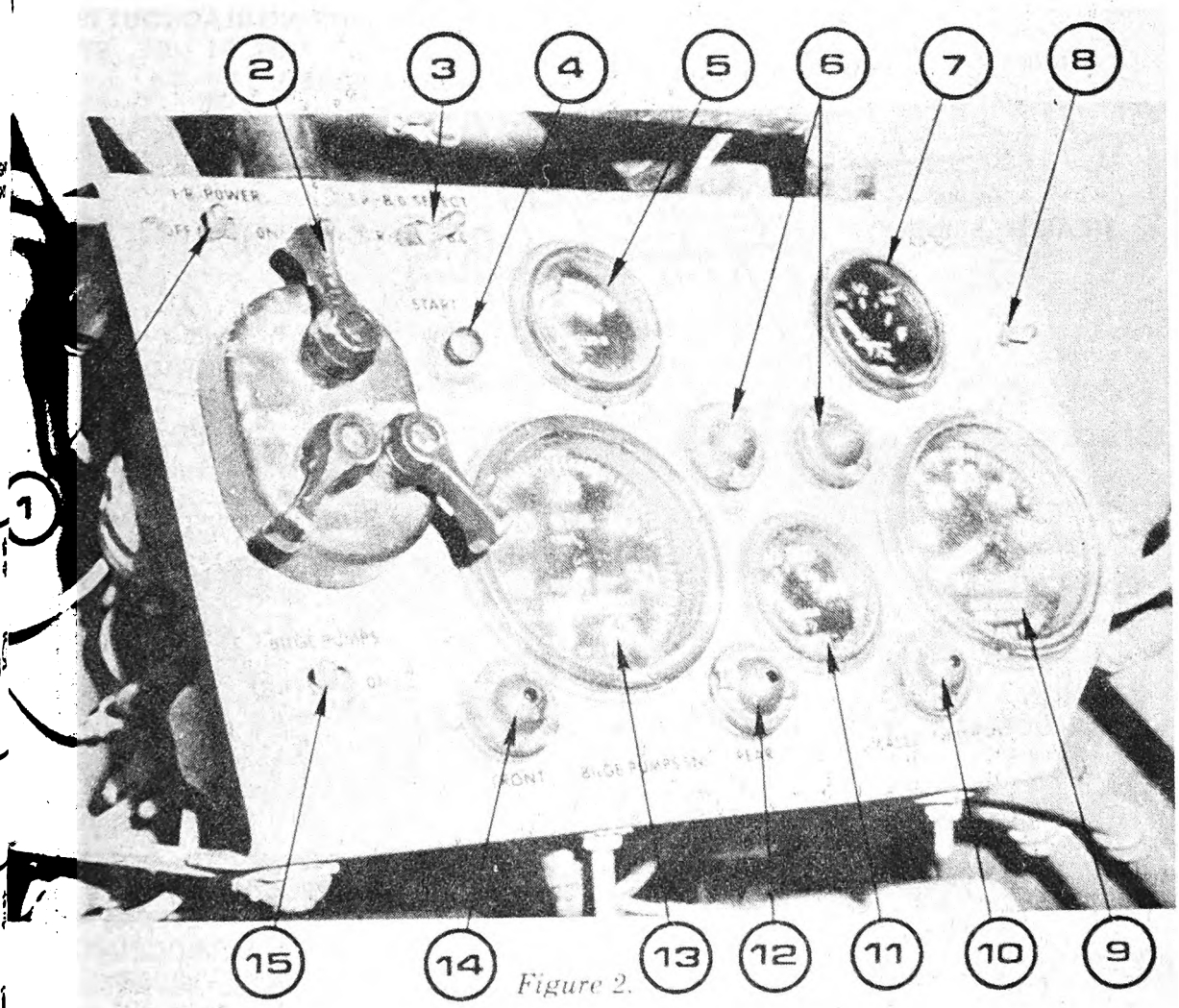

Figure 2.

1—I.R. POWER SWITCH
2—LIGHTS SWITCH ASSEMBLY
3—I.R-B.O. SELECT SWITCH
4—START SWITCH
5—BATTERY GENERATOR INDICATOR
6—PANEL LIGHTS
7—FUEL INDICATOR
8—AIR BOX HEATER SWITCH
9—SPEEDOMETER
10—MASTER SWITCH ON INDICATOR LIGHT
11—ENGINE TEMPERATURE INDICATOR
12—REAR BILGE PUMP ON INDICATOR LIGHT
13—TACHOMETER
14—FRONT-BILGE-PUMP-ON INDICATOR LIGHT
15—BILGE PUMPS SWITCH

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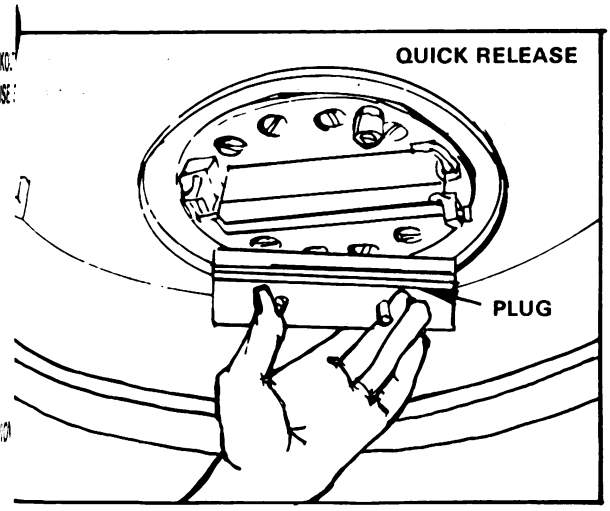
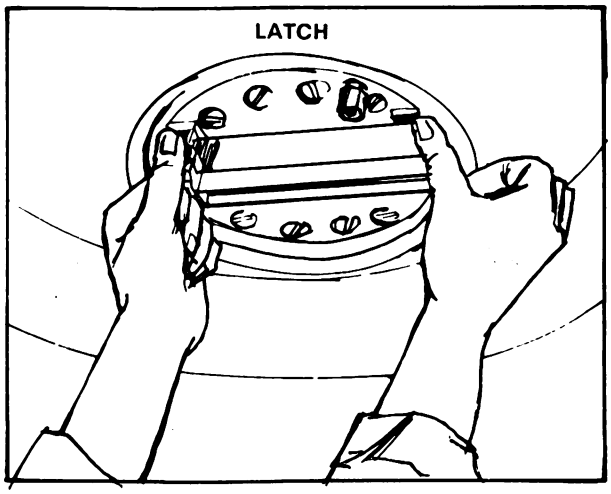
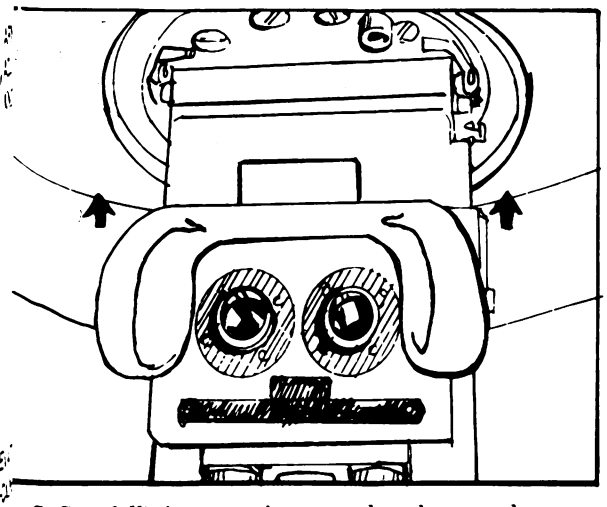


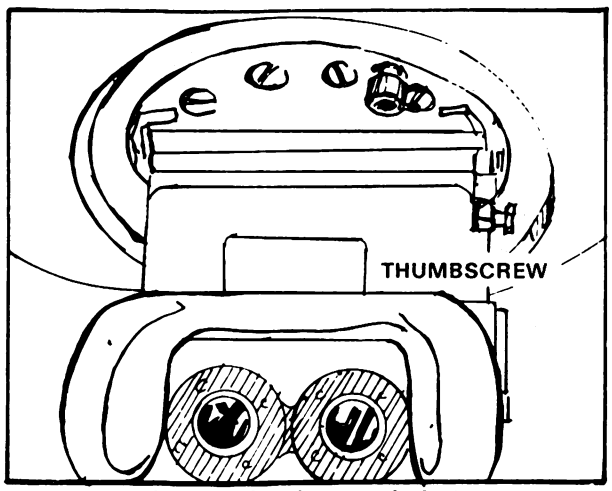
A. Remove plug from quick release.



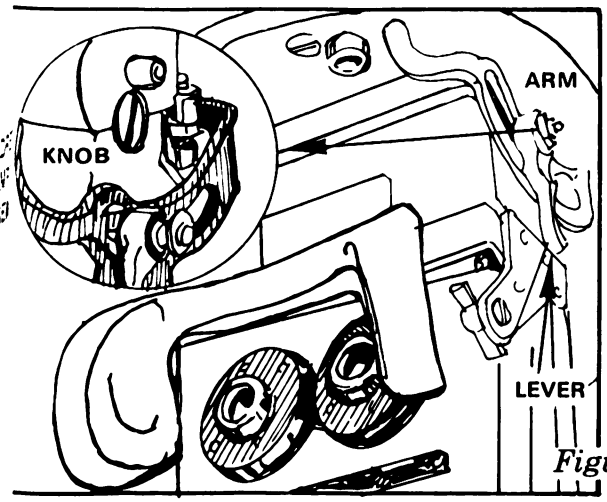
B. Push both periscope latches forward.



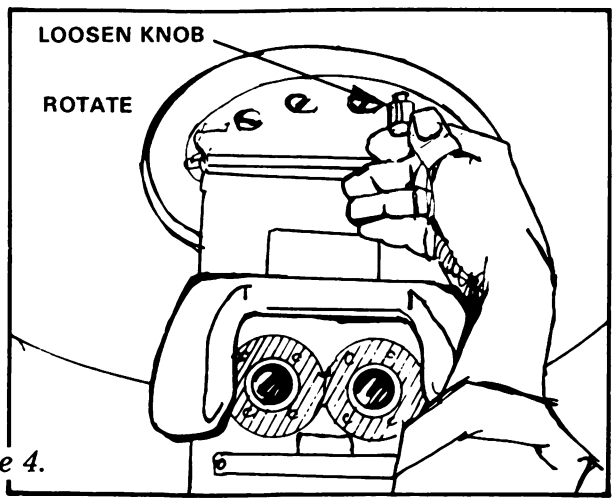
C. Carefully insert periscope and push upward.



D. Turn locking thumbscrew clockwise to secure periscope in quick release.



E. Loosen elevation locking lever, and set arm adjusting knob so both ends of elevation arm contact quick release.



F. Loosen azimuth locking knob, and rotate periscope to check operation.

Figure 4.

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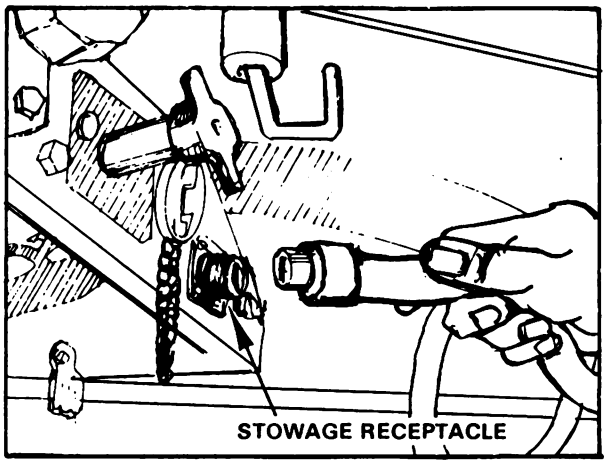
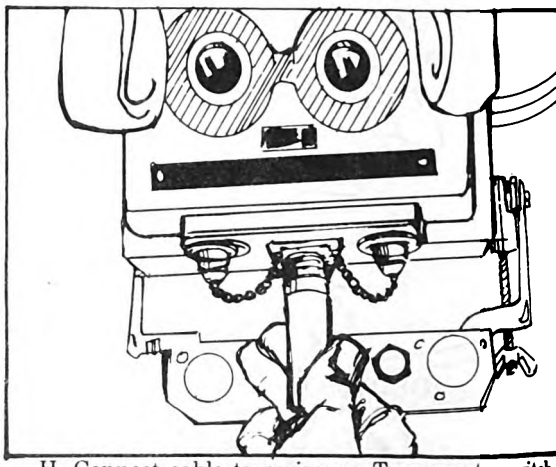
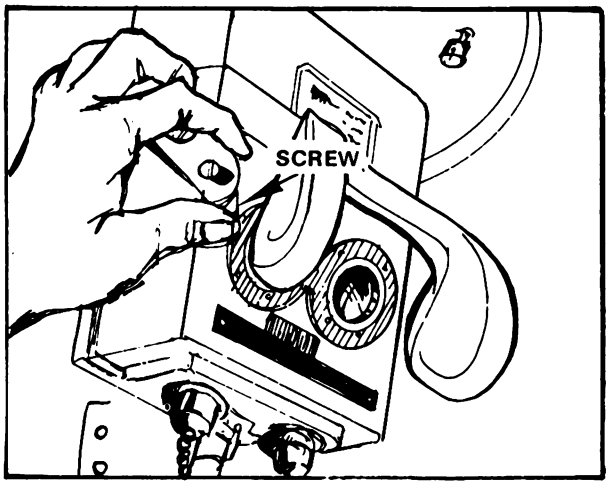


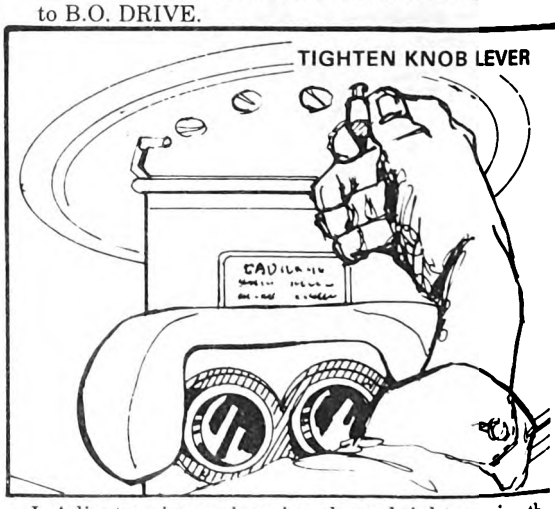
G. Remove periscope power cable from stowed position.



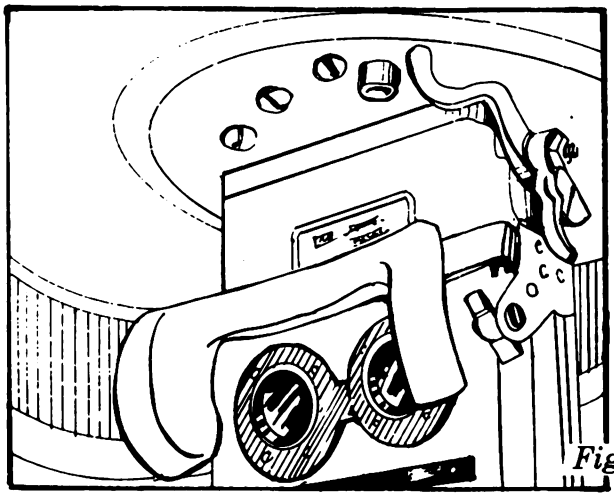
H. Connect cable to periscope. Turn master switch ON, infrared power switch ON, and main light switch to B.O. DRIVE.



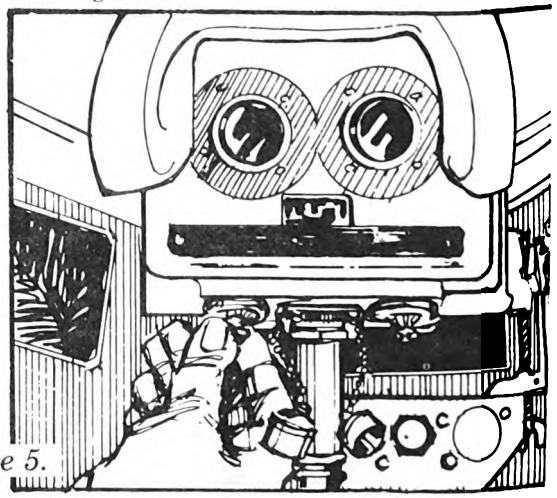
I. Loosen clamping screw, and adjust headrest.



J. Adjust periscope in azimuth, and tighten azimuth locking knob.



K. Adjust periscope in elevation, and tighten locking lever.



L. Focus each eyepiece with adjusting screw.

Figure 5.

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b. **Warning:** The infrared powerpack must be completely deenergized before the power cable is disconnected. The power cable must be installed in the periscope, not stowed before power is turned on. Failure to turn both the main light switch lever and infrared powerpack switch (figure 3) to OFF positions before disconnecting the cable will result in arcing, which may cause injury to personnel and damage to equipment. Before disconnecting the cable from periscope after use, wait 1 minute until residual charge in the system has drained off and then immediately move cable from periscope to stowage plug on master switch panel and secure receptacle down. Do not under any circumstances touch end of cable when moving from one plug to another because voltage of powerpack exceeds 16,000 volts.

REFERENCE:

TM 9-2300-257-10, Operator's Manual (Tracked Vehicle), Dec 73 (chap 2, pages 2-15 thru 2-17, para 2-22 thru 2-37; page 2-22, para 2-48; and page 2-87, para 2-132)

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TASK NUMBER: 071-333-6504

OPERATE AN APC IN WATER

CONDITIONS:

In daylight, at a field location with an unfordable water obstacle, given an operational APC; TM 9-2300-257-10; safety equipment as prescribed by TM 9-2300-257-10 and local SOP/regulations.

STANDARDS:

Prepare and drive the APC across the water obstacle.

PERFORMANCE MEASURES:

1. **Before entry:**

a. Check hull drain plugs, pipe plugs, and access plates.

b. Check bilge pump operation.

c. Insure track shrouds are properly installed and in good conditions.

d. Insure power plant door is secure.

e. Insure ramp door is secure.

f. Extend and lock trim vane.

g. Make certain periscopes are installed.

h. Turn on interior lights if tactical situations permits.

i. Close cargo and gunner's hatch covers, but not the driver's hatch cover.

2. **Entering water (with bilge pump operating):**

a. Do not enter water with waves higher than 1 foot.

b. Select firm, gradual slope (if not designated), free of obstacles.

c. Enter using 1-range, not exceeding 10 mph.

d. Personnel safety - Insure load is equally distributed. Know emergency procedures. Top hatch covers may be opened after the carrier is waterborne, except on mortar carriers. Accelerate and head for shore if carrier shows signs of flooding or swamping.

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3. **Driving in water:**

a. Shift to 1-2 range.

b. Steer carrier as on land using pivot steer levers instead of differential steering.

c. Slow-flowing waters (streams, rivers, bodies of water with current less than 2 mph) should be crossed diagonally, pointing APC up-current from intended exit point. Alternate means of crossing are explained in TM 9-2300-257-10.

4. **Stopping in water:**

a. Release accelerator slowly while pulling back gently on pivot steer levers to stop tracks.

b. Release levers; shift to reverse.

c. Depress accelerator.

d. When carrier has stopped forward motion, release accelerator, shift to neutral.

5. **Leaving water:**

a. Select exit point (if not designated) with firm, clear surface and gradual slope.

b. Approach shore so that both tracks strike land at the same time.

c. Remove foot from accelerator before striking ground.

d. Shift to 1-range when tracks strike ground.

e. Use pivot steer levers and 1-range until carrier is out of water.

f. Open hatch covers (if closed) and retract trim vane.

g. When bilge is clear of water, stop bilge pumps.

REFERENCE:

TM 9-2300-257-10, Operator's Manual, Carrier, Personnel, Full Tracked, Armored, M113 Dec 73 (chap 2, page 2-143 thru 2-148, para 2-193)

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TASK NUMBER: 071-333-6505

START THE APC ENGINE USING AUXILIARY POWER

CONDITIONS:

Given two M113A1 personnel carriers (one operative and one with a dead battery) and an auxiliary power cable.

STANDARDS:

Start the engine of the personnel carrier with the dead battery, using an auxiliary power cable, without damaging either vehicle.

PERFORMANCE MEASURES:

1. The auxiliary power cable receptacle on the master switch panel provides for use of 24-volt power from an outside source to start the engine, charge batteries, or operate electrical equipment.

2. To start the engine:

a. Turn master switch OFF before connecting auxiliary power cable (figure 1).

b. Unscrew protective cap from slave receptacle on master switch panel.

c. Connect auxiliary cable from external power source to receptacle.

CAUTION: Make certain prongs of auxiliary power source correspond to holes of carrier electrical system, as marked on slave receptacle (- to -, + to +).

d. Turn master switch ON, and start engine in normal manner.

e. Disconnect auxiliary power cable after engine starts.

f. Install protective cap on receptacle.

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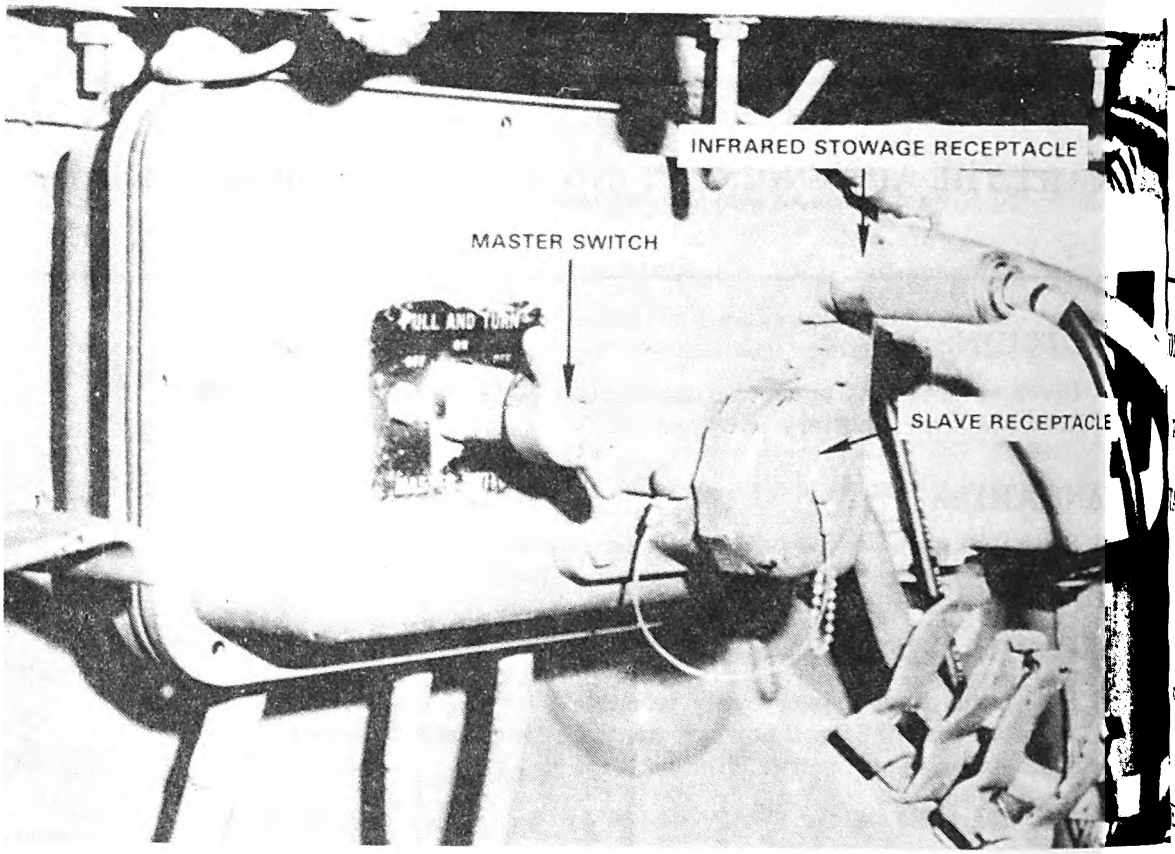

Figure 1.

REFERENCES:

TM 9-2300-257-10, Operator's Manual, Carrier, Personnel, Full Tracked, Armored, M113, Dec 73 (chap 2, page 2-13, para 2-13 thru 2-16; page 2-81, para 2-125)
TEC Lesson 944-441-0010-F (TBP)

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TASK NUMBER: 071-333-6506

PERFORM A TRACKED-VEHICLE ESC (EQUIPMENT SERVICEABILITY CRITERIA) INSPECTION

CONDTIONS:

Given an M113A1 personnel carrier, appropriate tools, logbook, ESCTM, pencil/pen, and the required number of DA Form 2404's.

STANDARDS:

Within 4 hours, the vehicle operator will:

1. Perform an ESC inspection on all subsystems of the carrier.

2. Determine and record on the appropriate DA Form 2404 the correct color rating for each component and subsystem.

3. Assign the lowest subsystem rating to the overall system evaluation.

PERFORMANCE MEASURES:

The conduct of the evaluation is prescribed in TM 9-2300-257-ESC. The correct method of recording the results is explained in TM 9-2300-257-ESC, and paragraph 3-4 of TM 38-750. A lubrication order may assist individuals in locating components.

REFERENCES

TM 38-750, The Army Maintenance Management System (TAMMS), C1, Nov 72 (chap 3, page 3-4, para 3-4)
TM 9-2300-257-ESC for Tracked Vehicles, Nov 72
LO 9-2300-257-12, Lubrication Order (M113A1), Oct 73

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TASK NUMBER: 071-333-6507

MAINTAIN REQUIRED TAMMS RECORDS ON A TRACKED VEHICLE

CONDITIONS:

Given DA Form 2404, a vehicle logbook, TM 38-750, and specific information pertaining to a vehicle.

STANDARDS:

1. Complete operator entries on the DA Form 2404 IAW TM 38-750.

2. Complete operator entries on the DA Form 2408-1 (Daily) IAW TM 38-750.

3. Compare any faults (shortcomings) given as pertaining to the vehicle with those listed on the 2408-14 to determine if they have been previously identified and corrective action taken.

4. Extract data pertaining to unapplied modifications for the vehicle from the DA Form 2408-5.

5. Extract data pertaining to component miles/hours from the DA Form 2408-10 and DA Form 2408-1 (Daily).

PERFORMANCE MEASURES:

1. DA Form 2404 is prepared IAW procedures outlined in paragraph 3-4 of TM 38-750.

2. DA Form 2408-1 (Daily) is prepared IAW procedures outlined in paragraph 4-5 of TM 38-750.

3. DA Form 2405-5 is prepared IAW procedures outlined in paragraph 4-8 of TM 38-750.

4. DA Form 2408-10 is prepared IAW procedures outlined in paragraph 4-10 of TM 38-750.

5. DA Form 2408-14 is prepared IAW procedures outlined in paragraph 4-13 of TM 38-750.

REFERENCES:

TM 38-750, The Army Maintenance Management System (TAMMS), Nov 72 (chap 4, page 4-36 & 37, para 4-20)
TEC Lesson 510-0907-6453-F (TBP)
TEC Lesson 510-0901-6455-F (TBP)
TEC Lesson 510-0901-6456-F (TBP)
TEC Lesson 510-0901-6457-F (TBP)
TEC Lesson 510-0901-6472-F (TBP)

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TASK NUMBER: 071-333-6508

PERFORM OPERATOR MAINTENANCE ON AN APC

CONDITIONS:

Given an M113A1 personnel carrier with basic issue items, TM 9-2300-257-10, LO 9-2300-257-12, the vehicle logbook, TM 38-750, and a DA Form 2404.

STANDARDS:

The operator will:

1. Perform before-, during-, and after-operation maintenance on the vehicle IAW instructions in TM 9-2300-257-10.

2. Identify maintenance deficiencies/shortcomings and correct those within the operator's capability.

3. Cross-reference uncorrectable faults against the DA Form 2408-14.

4. Prepare a DA Form 2404 to notify organizational maintenance of previously unreported correctable faults or repairs which require a part.

5. Lubricate the vehicle IAW the lubrication order.

6. Perform troubleshooting procedures on the vehicle IAW TM 9-2300-257-10.

PERFORMANCE MEASURES:

1. Operator maintenance follows procedures outlined in the preventive maintenance services section of TM 9-2300-257-10 (chap 3, sec III).

2. To correct deficiencies/shortcomings, refer to TM 9-2300-257-10.

3. Previously reported faults beyond the operator's capability to repair or those requiring parts are recorded on the Uncorrected Fault Record (DA Form 2408-14) in the vehicle logbook. This form is completed by organizational maintenance IAW procedures outlined in paragraph 4-13 of T 38-750. Do not fill out the -14.

4. Faults which the operator cannot correct or which require a part are recorded on DA Form 2404 IAW procedures outlined in paragraph 3-4 of TM 38-750.

5. The vehicle is lubricated IAW the instructions in LO 9-2300-257-12.

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6. Troubleshooting procedures are outlined in the troubleshooting section of TM 9-2300-257-10 (chap 3, sec IV).

REFERENCES:

TM 38-750, The Army Maintenance Management System (TAMMS), Nov 72 (chap 3, page 3-4 thru 3-8, para 3-4)
TM 9-2300-257-10, Operator's Manual Carrier, Personnel, Full Tracked, Armored, M113, Dec 73 (chap 3, page 3-12 thru 3-18, para 3-23)
LO9-2300-257-12, Lubrication Order (M113A1), Oct 73
TEC Lesson 945-171-0051-F TBP
TEC Lesson 945-171-0052-F TBP
TEC Lesson 945-171-0053-F TBP
TEC Lesson 945-171-0054-F, TBP

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TASK NUMBER: 071-333-6509

RECOVER A TRACKED VEHICLE USING FIELD EXPEDIENTS

CONDITIONS:

During combat or training under all types of weather conditions, given a disabled tracked vehicle requiring recovery (the vehicle is equipped with basic issue items), other applicable materials for expedient recovery, or a similar vehicle.

STANDARDS:

Recover the disabled tracked vehicle using one of the following:

1. Similar vehicle if available for recovery.

2. Vehicle's basic issue items for self-recovery.

3. Any of the expedient methods below:

a. Anchoring the tracks.

b. Using an armored personnel carrier anchoring track (APCAT) device.

c. Using a capstan kit.

PERFORMANCE MEASURES:

1. **Methods of Recovery.** There are four methods of vehicle recovery using organizational personnel and equipment.

a. Winching. Operations performed using winches on special purpose vehicles or cargo-type vehicles.

b. Towing. Operations performed using towing capabilities of similar or special purpose vehicles. This is the quickest recovery method.

c. Lifting. Operations performed using special purpose vehicles.

d. Expedients. Operations performed when other methods are not adaptable to the situation or when additional vehicles and equipment are not readily available.

2. **Levels of Recovery.** Recovery operations performed within an organization are divided into levels. Levels are based on personnel who perform the operations and equipment available to them.

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a. Platoon Level. Recovery is performed by vehicle drivers and crews, under supervision of squad, section, or platoon leader. At this level, winching, towing, and expedient methods of recovery are employed, using platoon vehicles and equipment.

b. Company and Battalion Levels. Recovery is performed by general vehicle repairmen or recovery specialists under the supervision of the recovery chief, using winching, towing, and lifting methods of recovery with special purpose vehicles. Because of the increased number of special purpose vehicles at battalion level, a greater recovery capability exists there than at company level.

3. **Procedure for Recovery.** During any recovery operation, a proven procedure should be used to insure quick and safe accomplishment. A haphazard approach to a recovery problem or the trial and error method can only result in prolonged immobility of the disabled vehicle, loss of valuable time, damage to equipment, and possible injury to personnel. The following eight-step recovery procedure, in the proper sequence, should be used in any recovery involving winching.

RECOVERY PROCEDURE

RECONNOITER AREA

ESTIMATE SITUATION

CALCULATE RATIO

OBTAIN RESISTANCE

VERIFY SOLUTION

ERECT RIGGING

RECHECK RIGGING

YOU ARE READY

4. **Equipment and Support for Recovery.** The amount and type of equipment employed as the source of effort during any recovery operation is dependent upon the level of recovery, as discussed in paragraph 2. Every effort should be made by the drivers and crews to accomplish the recovery before calling on support from a higher level. During combat it may be of the utmost importance that cargo reach its destination at a definite time or that personnel or cargo be picked up at a given time or that a combat vehicle be at a given place at a specific time. Recovery support should be called upon only when the similar vehicles are not adaptable to the situation or when the tactical situation does not permit their use. ENGAGED COMBAT VEHICLES SHOULD NEVER BE DIVERTED FOR THE PURPOSE OF RECOVERY.

5. **Use of Similar Vehicles for Recovery.** The use of similar vehicles for recovery usually constitutes the QUICKEST METHOD of recovery because similar vehicles are most readily available. The number of tracked vehicles required for a specific recovery is dependent upon the resistance to

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be overcome, the type of disablement, and the condition of the terrain on which the towing vehicles must be operated. The rigging is accomplished using the vehicle tow cables attached to the tow hooks of the vehicles. All main battle tanks carry two tow cables; light tracked vehicles carry one tow cable.

a. When two tow cables are used between two vehicles, the cables should be crossed. This prevents them from entangling in the tracks on turns and maintains alinement of the vehicles (figure 1). If a greater working distance between the pulling vehicle and a mired vehicle is required, two cables can be joined together by using tow hooks.

b. To recover a mired vehicle using a similar vehicle:

(1) Position towing vehicle and shut off engine.

(2) Attach tow cables to tow hooks at rear of towing vehicle.

(3) Attach tow cables to tow hooks of mired vehicle.

NOTE: Cables must be crossed.

(4) Start towing vehicle.

(5) Shift towing vehicle transmission into 1st range and slowly take up slack in cables.

(6) Stop towing vehicle.

(a) Shift transmission to neutral.

(b) Lock brakes.

(c) Shut off engine.

(7) Recheck rigging.

CAUTION: Insure that all safety keys are installed in tow hook pins.

(8) Start towing vehicle.

(a) Shift transmission to 1st range.

(b) Release brakes.

(9) Instruct driver of mired vehicle to prepare his vehicle for movement.

(10) Slowly apply power and move forward.

NOTE: Driver of mired vehicle must apply power to assist in recovery.

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(11) Tow the mired vehicle until both vehicles are on a hard surface.

(12) Instruct driver of towed vehicle to slowly move forward to provide slack in the towing cable.

(13) Stop recovered vehicle.

(14) Place transmission of both vehicles in neutral, lock brakes, and shut off engines.

(15) Disassemble and stow rigging.

If two towing vehicles are required for an operation, only one tow cable is required between the towing vehicles because the strength of one tow cable is slightly greater than the pulling effort of the second pulling tank; however, when two tow cables are available, they should be used to maintain alinement and equalize the pulling effort.

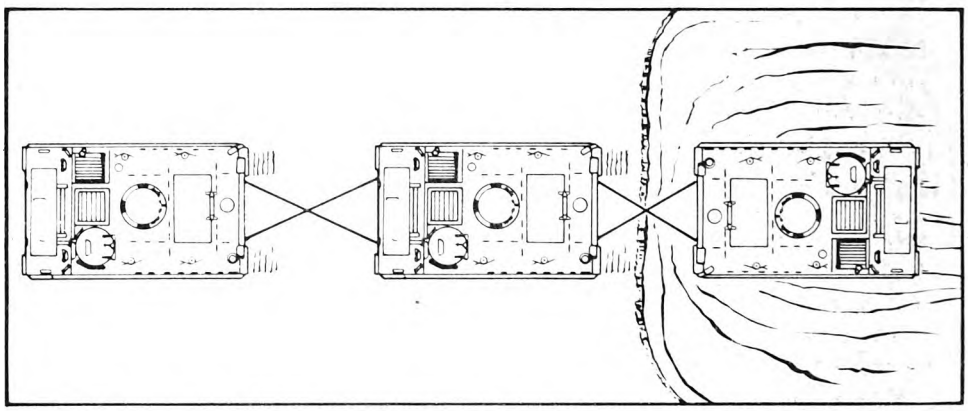

Figure 1. Towing mired APC, using two similar vehicles.

c. The recovery of a nosed tracked vehicle (figure 2) may require as many as three similar vehicles, depending on the degree to which it is nosed and the condition of the terrain on which the pulling vehicles must operate. In extreme situations, a source of effort may be necessary to lift the front of the nosed vehicle. To use a lifting vehicle, two or more tow cables should be connected together to obtain a greater working distance between the nosed vehicle and the lifting vehicle. The lifting vehicle should be positioned facing the nosed vehicle. The cables of the pulling vehicles are connected in the same manner as for recovery of a mired vehicle. Power should be applied to all the assisting vehicles at the same time, until the front of the nosed vehicle is raised and starts moving rearward, then the lifting vehicle should move forward slowly supporting the vehicle until it is recovered. If there has been any spillage of oil or fuel in the nosed vehicle, its engine should not be operated until such spillage has been cleaned up.

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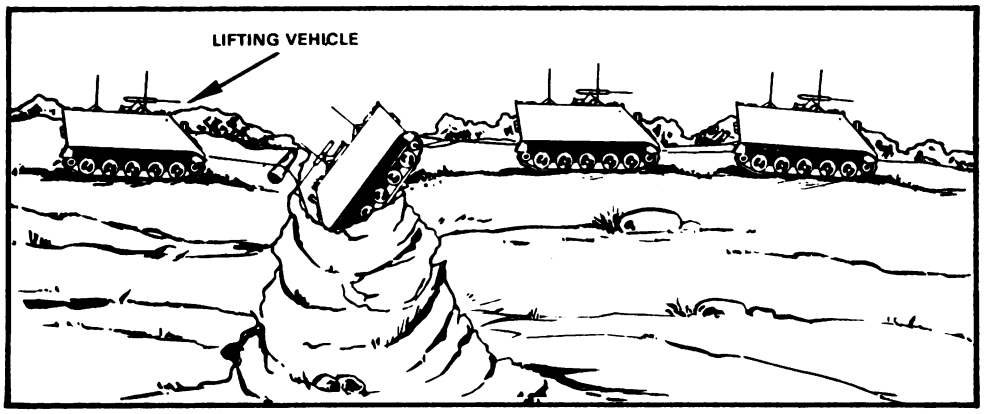

Figure 2. Recovering nosed APC with similar vehicles.

d. An overturned tracked vehicle can be uprighted by using three similar vehicles (figure 3). One vehicle is used to pull the overturned vehicle upright; the other two vehicles are used to hold and retard the fall of the overturned vehicle to prevent its crashing down on the suspension system. Two cables should be connected together in pairs to allow safe working distance. The cable used to upright the overturned vehicle should be connected to the nearest center roadwheel arm support housing on the high side of the overturned vehicle. Never connect to any other part of the suspension system, turret, or the tiedown eyes. The two vehicles used for holding should be positioned at a 30° to 45° angle from the overturned tank with their cables connected to the two hooks on the high side of the overturned vehicle. The holding vehicles are so positioned to prevent damage to the cables or the fenders and lights of the overturned vehicle as it is uprighted. Drivers of the holding vehicles shift to low range; the pulling vehicle applies power gradually in reverse, while the holding vehicles move forward only enough to keep their cables taut until the overturned vehicle passes through the point of balance. As the overturned vehicles passes through the balance point, the holding vehicles move forward slowly, supporting the overturned vehicle and lowering it onto its suspension system. Because of spilled oil and fuel that will normally be present, extreme caution must be exercised to prevent smoking or open flames near the overturned vehicle.

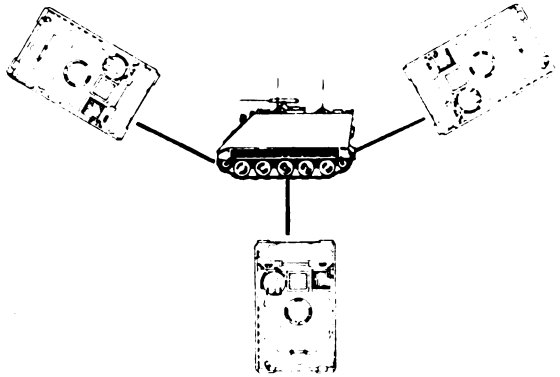

Figure 3. Recovering overturned APC with similar vehicles.

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6. **Recovery Expedients.** Military operations will require vehicles to operate in remote areas where, should disablement occur, assistance would not be readily available. Under these conditions, the driver or crew must attempt self-recovery by the use of expedients. An expedient is an improvised method and is accomplished with the materials on hand.

a. Anchoring Tracks. Vehicles often become bellied (high-centered) on stumps, rocks, and dry ridges, or in mire. In this position, vehicles are immobilized because of the lack of traction.

(1) To recover a bellied vehicle in mire (figure 4), obtain a log long enough to span the width of the vehicle and of sufficient diameter to support the vehicle weight. The log is placed against both tracks, and a tow cable is placed so one end of the cable goes over the log and through the tracks from the inside. The other end of the tow cable is placed underneath the log, and the ends of the cable are connected together with a tow hook on the outside of the track to facilitate disconnecting. The same procedure is followed to attach the log to the track on the opposite side of the vehicle. By gradually applying power to the tracks, the slack in the tow cables will be taken up, pulling the log underneath the tracks until it comes in contact with the obstacle, anchoring the tracks and causing the vehicle to move.

(2) Follow these steps to self-recover a tracked vehicle bellied in mire:

(a) Erect rigging.

1. Place log against both tracks.
2. Position two cables (both tracks).
3. Connect ends of cable using two hooks (both tracks).

(b) Recover tracked vehicle.

1. Start engine.
2. Release brakes.
3. Shift transmission selector lever to desired position.
4. Gradually apply power to tracks.

(c) Stop vehicle.

1. Shift transmission selector lever to neutral or park position.
2. Lock brakes.
3. Shut off engine.

(d) Disassemble and stow rigging.

CAUTION: Care must be taken to stop the vehicle before the log reaches the fenders to prevent damage to the fenders and tow cables.

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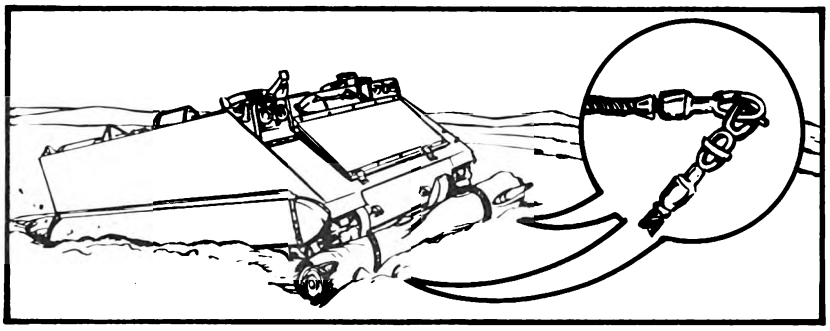

Figure 4. Recovering a bellied vehicle in mire.

(3) For a bellied disablement other than mire, the tracks can be anchored using two tow cables. Connect the tow cables together with a tow hook and attach the cables to both tracks by passing the ends of the cables through the tracks from the outside and attaching them to the standing parts of the cables with two hooks. When power is applied to the tracks, the cables will contact the obstacle and anchor the tracks. The same caution must be exercised as outlined in (1) above.

b. APCAT Device. APCs may fail to exit the water after swimming due to steep banks or adverse terrain conditions. As an aid to water exit, the APCAT expedient can be used. The APCAT expedient kit consists of one pair of track anchor blocks (fabricated locally) and 200 feet of 1-inch fiber rope (figure 5). The track anchor blocks are placed in the blocks to suitable anchorages. As power is gradually applied, the tracks will anchor themselves to the blocks and cause the vehicle to move. This expedient may also be used in mire or bellied situations.

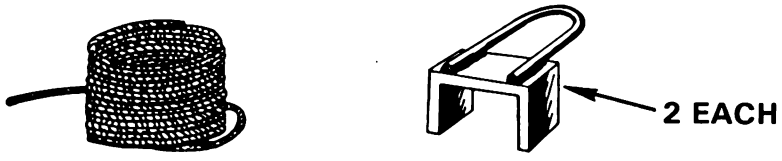

Figure 5. APCAT expedient kit.

c. Capstan Kit (figure 6). (This kit may be ordered through your maintenance shop.) When leaving water after swimming operations, an APC may become disabled because of the steep angle of the bank, the muddy or slippery surface of the bank, or a combination of both, and cannot exit. A capstan expedient can be used for a self-recovery. The capstan kit consists of one pair of capstan adapters that bolt to the drive sprocket hub, one pair of capstan drums with mounting tee bolts, nylon rope, and one pair of ground anchors. Normally, the capstan adapters are permanently mounted to the drive sprocket hubs with the metal shrouds plates cut away.

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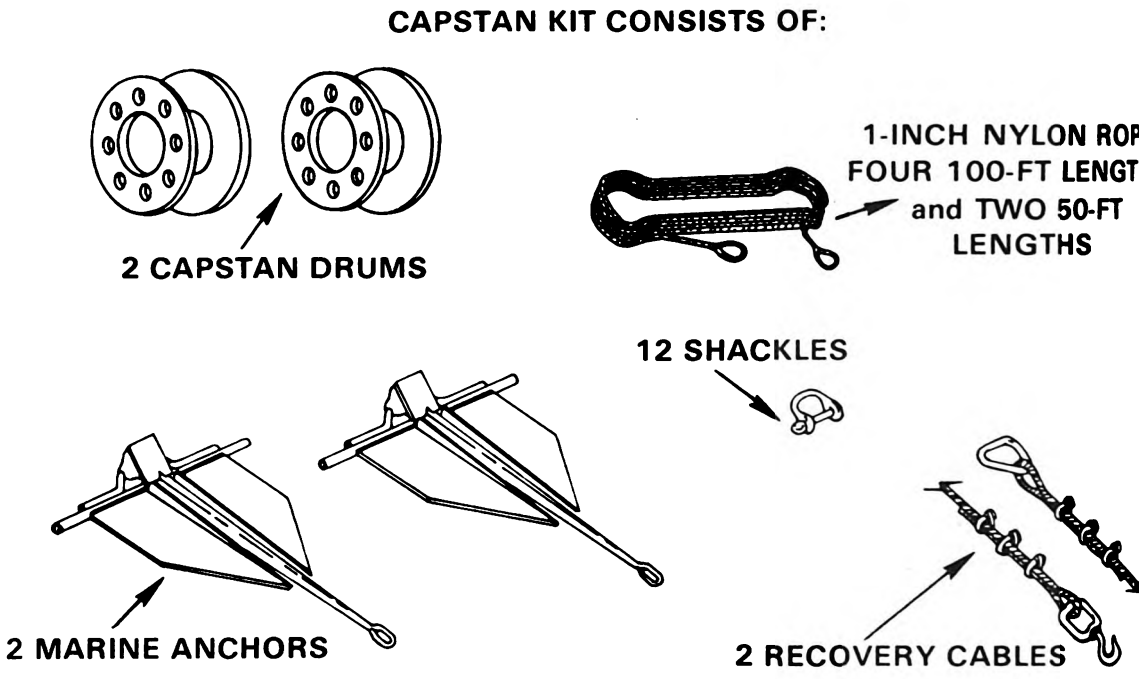

Figure 6. Capstan kit.

The capstan drums can be very quickly installed to the adapters with the drum tee bolts. The rope is secured to each mounted capstan drum, and wrapped two or three turns around the drums on both sides of the vehicle. Care must be taken to insure that the anchors are positioned in line with the capstan drums. The ropes must extend from the underside of the capstan drum before they are tied to their respective anchors. By applying power to the tracks, the ground anchors will embed in the ground, and the winching action of the capstan drums will cause the vehicle to move. To recover a tracked vehicle using the capstan kit:

(1) Lock brakes and steering levers.

(2) Stop engine.

(3) Remove capstan kit from stowed position.

(4) Remove mud and debris from around sprocket wheels.

(5) Attach drum assemblies to sprocket wheels.

(6) Position anchors at desired location.

(7) Connect ropes to anchors.

(8) Attach anchor recovery cables to anchors.

(9) Attach ropes to drums and take up slack.

NOTE: Ropes must be pulled tight and kept away from drum to prevent them from winding into the drum or catching in the track.

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(10) Start engine.

(11) Release brakes and steering levers.

(12) Position range selector in 1st range.

(13) Apply power slowly until anchors are embedded and carrier starts forward motion.

(14) Continue forward motion until carrier is free of obstacles.

(15) Stop carrier.

(a) Lock brakes and steering levers.

(b) Position range selector in neutral.

(c) Stop engine.

(16) Disassemble capstan kit.

(17) Recover anchors.

(18) Stow capstan kit in travel position.

REFERENCES:

FM 5-34, Engineer Field Data, Sep 76 (chap 16, page 367, para 16-7)
FM 20-22, Vehicle Recovery Operations, Jul 70 (chap 2, pages 5 & 6, para 3; chap 5 and 6, pages 58 thru 108, para 45 thru 85)

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TASK NUMBER: 071-333-6510

MAINTAIN AUXILIARY GENERATOR ON M577 TRACK VEHICLE

CONDITIONS:

Given an M577A1 track vehicle with generator set mounted.

STANDARDS:

1. Perform before-, during-, and after-operation maintenance on the generator set IAW instructions in TM 5-2805-203-14 and TM 9-6115-202-14.

2. Identify maintenance deficiencies/shortcomings and correct those within the operator's capability.

3. Prepare a DA Form 2404 to notify organizational maintenance of previously unreported correctable faults or repairs which require a part.

PERFORMANCE MEASURES:

1. Perform all operator maintenance steps for the generator set IAW TM 9-6115-202-14, chap 3, page 3-3, para 3-9 thru 3-12.

2. Perform all operator maintenance steps for the generator set engine IAW TM 5-2805-203-14, chap 3, page 3-1, para 3-1 thru 3-6.

3. Perform all operator lubrication steps for the generator set IAW LO 5-2805-203-14.

4. Any deficiency/shortcoming not covered in the preventive maintenance checks and services is referred to the organizational maintenance personnel.

5. Faults which the operator cannot correct or which require a part are recorded on DA Form 2404 IAW procedures outlined in paragraph 3-4 of TM 38-750.

REFERENCES:

TM 5-2805-203-14, Operator, Organizational, DS, and GS Maintenance Manual (chap 3, page 3-1, para 3-1 thru 3-6)
TM 9-6115-202-14, Operator, Organizational, DS, and GS Maintenance Manual (chap 3, page 3-3, para 3-9 thru 3-12)
TM 38-750 (para 3-4)
LO 5-2805-203-14

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TASK NUMBER: 071-333-6511

INSTALL/OPERATE AUXILIARY GENERATOR ON M577 TRACKED VEHICLE

CONDITIONS:

Given an M577A1 track vehicle with generator set dismounted, TM 9-2300-257-10, and TM 9-6115-202-14.

STANDARDS:

Within 30 minutes, install generator set in the inclosure on vehicle, connect auxiliary power cable, and start and operate generator set.

PERFORMANCE MEASURES:

1. **To install and remove generator set on M577A1 track vehicle:**

a. Removal (figure 1).

CAUTION: Make certain both power receptacle covers are attached before removing set.

(1) Loosen four thumbscrews, and rotate 90 degrees the four clamps securing generator set to inclosure.

(2) Remove davit and block-and-tackle from stowed position.

(3) Position davit in mounting bracket; attach block-and-tackle hooks to davit and lifting bar on generator set.

(4) Hoist generator set sufficiently to clear inclosure, and swing generator set clear of carrier and lower to ground.

(5) Stow davit and block-and-tackle.

b. Installation (figure 1).

NOTE: Make certain both power receptacle covers are attached before installing set.

(1) Remove davit and block-and-tackle from stowed position.

(2) Position davit in mounting brackets; attach block-and-tackle hooks to davit and lifting bar on generator set.

(3) Hoist generator set sufficiently to clear carrier and inclosure; swing generator set into position and lower into inclosure.

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(4) Position four clamps to secure generator set in inclosure, and tighten four thumbscrews.

(5) Stow davit and block-and-tackle.

2. **To operate generator set.**

NOTE: Generator set must be level when operating.

a. Turn master switch to OFF position.

b. Remove auxiliary power cable from stowed position.

c. Connect auxiliary power cable to left front or right rear receptacle on generator set (figure 2) and to auxiliary power receptacle on carrier (figure 3).

d. Turn master switch to ON position.

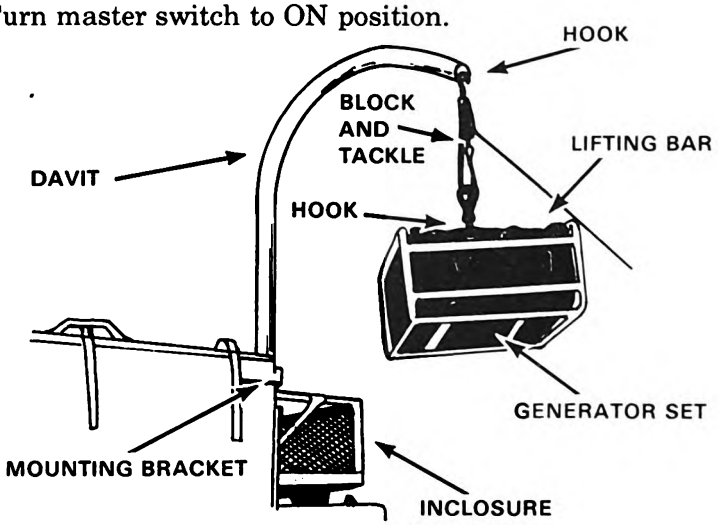
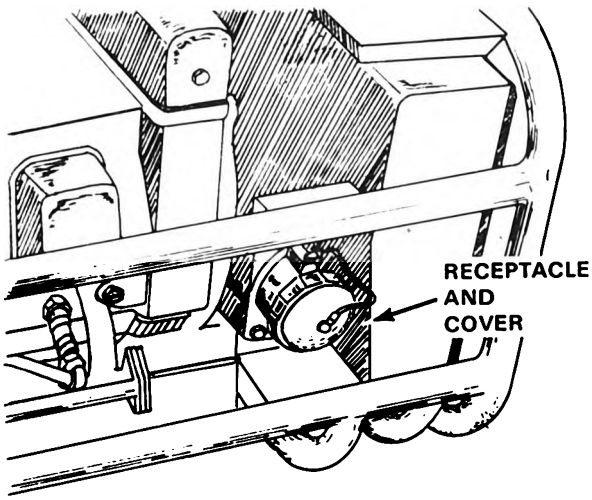
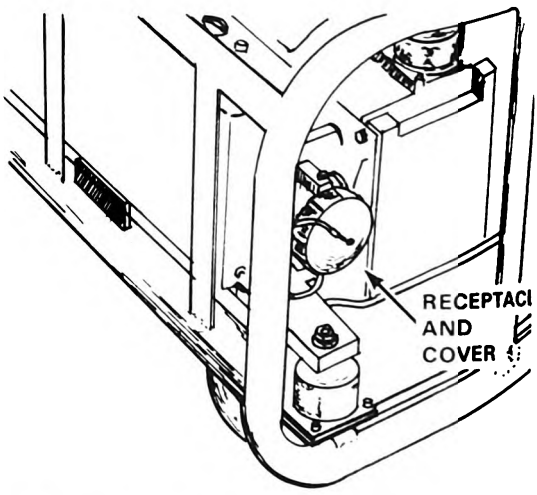


Figure 1.



A. Left front receptacle.



B. Right rear receptacle.

Figure 2.

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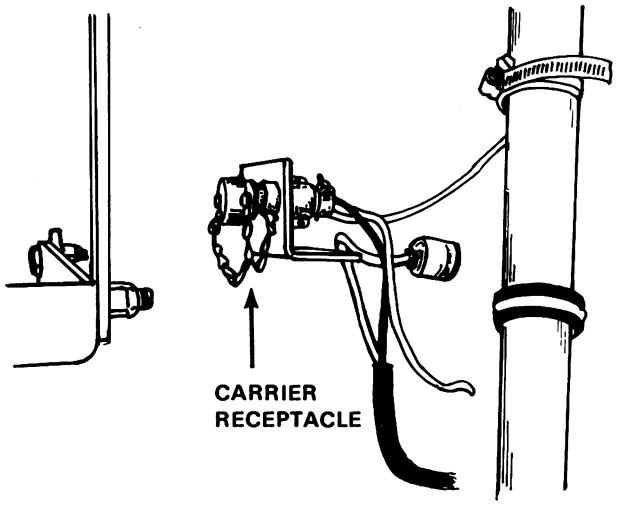

Figure 3.

e. Start and operate generator set as described in TM 9-6115-202-14, chap 3, page 3-3, para 3-9 thru 3-12.

REFERENCES:

TM 9-2300-257-10, Operator, Organizational, DS, and GS Maintenance Manual (chap 2, page 2-89, para 2-134 and 2-135)
TM 9-6115-202-14, Operator, Organizational, DS, and GS Maintenance Manual (chap 3, page 3-3, para 3-9 thru 3-12)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION VIII
MORTAR GUNNERY

TASK SUMMARIES

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TASK NUMBER: 071-321-3901

PLACE A GROUND-MOUNTED 81-MM MORTAR INTO ACTION

CONDITIONS:

You are the gunner on an 81-mm mortar. Given an 81-mm mortar complete with sight (either M53 or M34A2), baseplate, and direction stakes, and two personnel to act as assistant gunner and ammunition bearer. Each member of the mortar crew will perform this task acting as the gunner.

STANDARDS:

The mortar will be mounted within 90 seconds IAW the performance measures below.

PERFORMANCE MEASURES:

To ground-mount the 81-mm mortar:

1. Baseplate stake and the direction stake will be in place, 25 meters apart (figure 1).

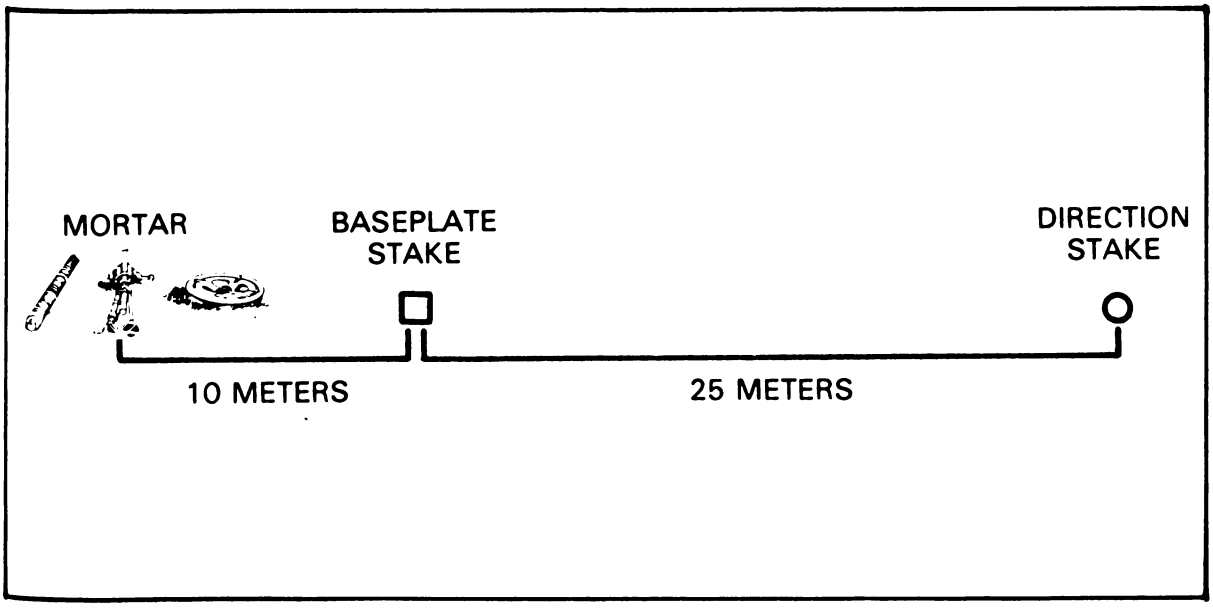

Figure 1.

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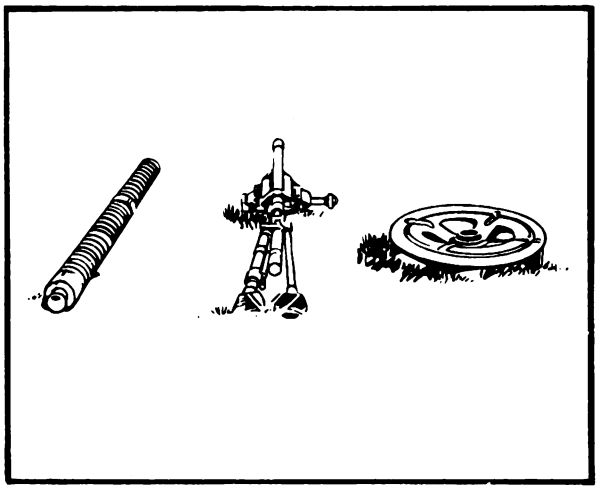

Figure 2.

Figure 3.

2. Bipod, barrel, and baseplate will be laid out (as shown in figure 2) 10 meters to the rear of the baseplate stake (figure 1).

3. The sight, in its locked case, will be placed 2 feet to the left and 2 feet in front of the baseplate stake (the gunner has the option of placing the sightcase anywhere he wants it in relation to the baseplate stake) (figure 3).

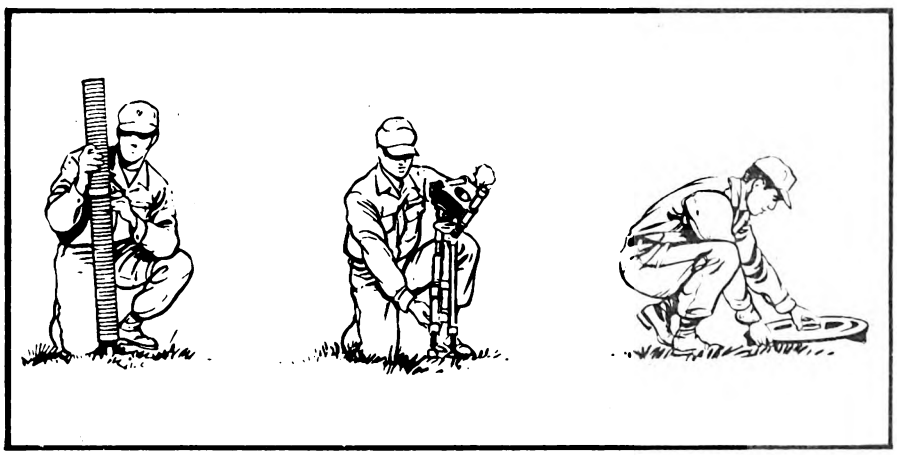

Figure 4.

4. At the command "MAKE A PREMOUNT CHECK," the crew members will make the following checks (figure 4):

a. Gunner: The gunner will make the following checks on the bipod.

(1) The spread chain is doubled, wrapped around the legs, and hooked to the left leg.

(2) There is a two-finger clearance above the adjusting nut on the left leg.

(3) The locking nut is neither too loose nor too tight.

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(4) The traversing bearing is centered.

(5) The clevis locking pin is fully seated and not binding.

b. Assistant Gunner: The assistant gunner makes the following checks on the barrel:

(1) Mount attachment ring is centered between the white lines on the barrel.

(2) Barrel is clean inside and outside.

(3) Firing pin is visible.

(4) The spherical projection is clean and the firing pin is firmly seated.

c. Ammo Bearer: The ammo bearer makes the following checks on the baseplate:

(1) The rotatable socket cap moves freely.

(2) Baseplate has no cracks.

d. As each member of the crew checks his piece of equipment, he will notify the gunner that it is "OK," or what is wrong with it. When the gunner is satisfied that all is ready, he will announce to the squad leader "ALL CORRECT." The crew is now ready to mount the mortar.

5. Perform the following actions upon the squad leader's command "TO YOUR FRONT, ACTION."

a. At the command "TO YOUR FRONT," all crew members will secure their piece of equipment from the ground (figure 5).

b. At the command "ACTION," the crew members will move rapidly to the baseplate stake (figure 6).

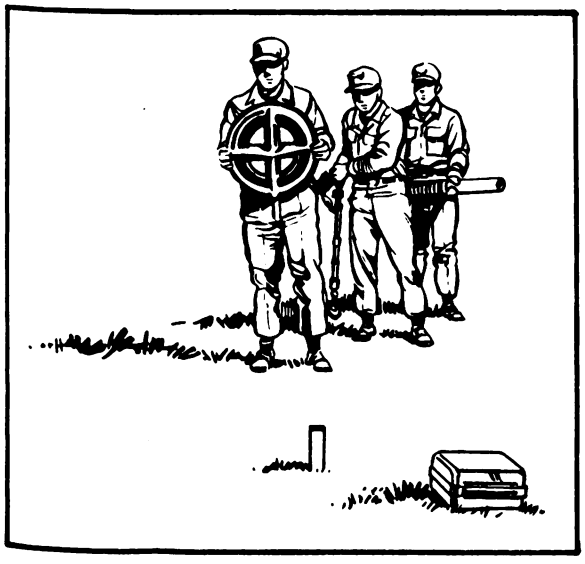

Figure 5.

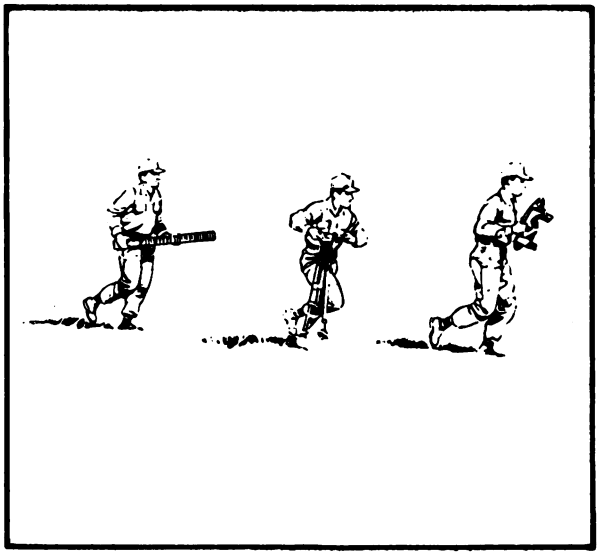

Figure 6.

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c. At the baseplate stake, the following actions will take place:

(1) The ammo bearer will place the front edge of the baseplate against the stake, aline the left edge of the cutout portion with the baseplate stake (figure 7), and move out of the way.

(2) The gunner will move around and to the front and face the baseplate (figure 8).

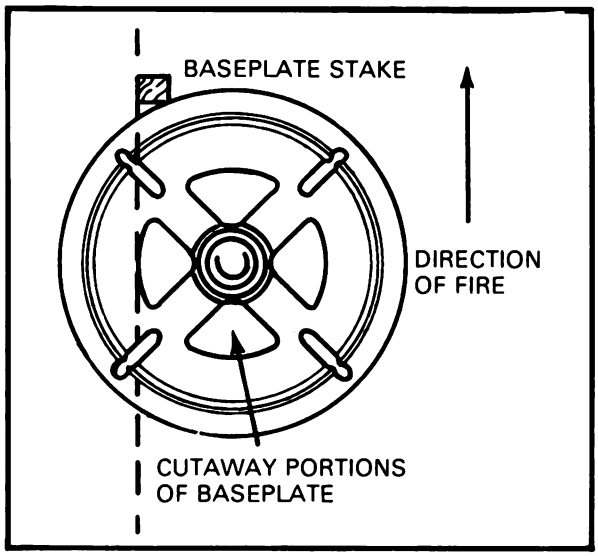

Figure 7.

Figure 8.

(a) He places the bipod about 2 feet in front of the baseplate, alined with the right edge of the baseplate.

(b) Kneeling on his right knee in front of the bipod and supporting it by holding the gear case with his left hand, he unhooks the chain, unwinds it, and rehooks the end loop on the chain hook.

(c) He lifts the left leg and opens the legs to the full extent of the doubled chain.

(d) He centers the guide tube and locks the locking nuts (figure 8).

(e) The gunner then moves to the left side of the bipod while supporting the bipod with his left hand on the shock absorber, pulls out the clevis locking pin, and raises the yoke assembly to the horizontal position (figure 9).

(f) The assistant gunner inserts the barrel (mounts attachment ring lug up) into the yoke assembly until the lug fits into the shock absorber clevis (figure 9).

(g) The gunner then inserts the clevis locking pin (figure 9).

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(h) The assistant gunner then lowers the rear of the barrel, inserts the spherical projection into the baseplate socket, and locks the barrel to the base by turning the barrel 90 degrees (1/4 turn).

(i) The gunner takes the sight out of the sightbox and inserts it into the dovetail slot on the yoke assembly and sets the mounting data on the sight:

1. M53 Sight.

   a. Deflection 3200

   b. Elevation 1100

2. M34A2 Sight.

   a. Deflection 0

   b. Elevation 1100

(j) With the help of the assistant gunner, he shifts the bipod (if needed) and lays on the directional stake with the correct sight picture (figures 10 and 11) and ALL bubbles level.

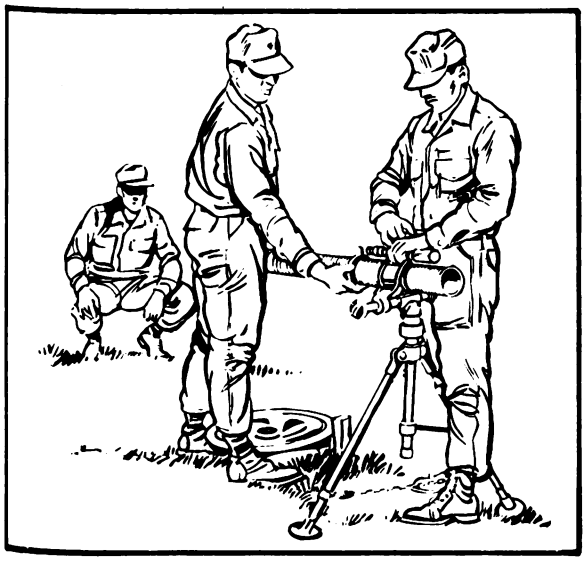

Figure 9.

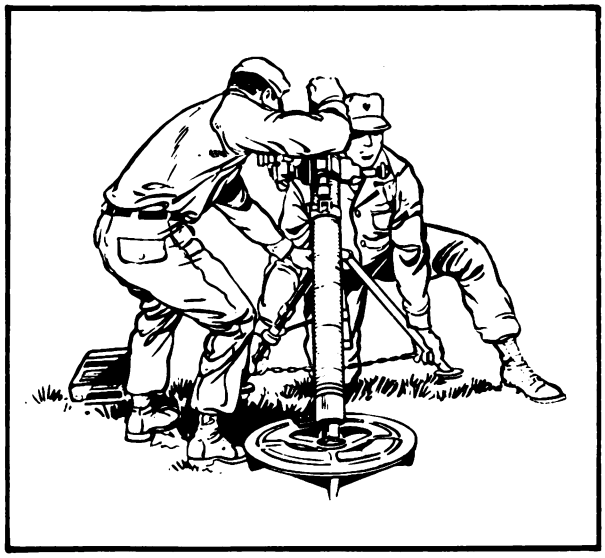

Figure 10.

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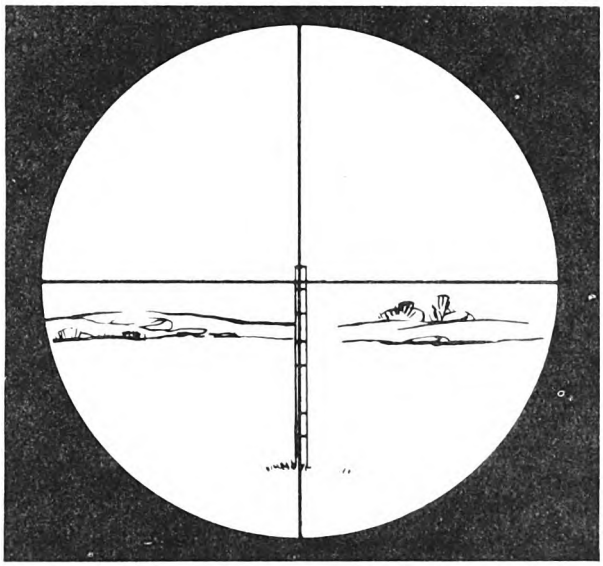

Figure 11.

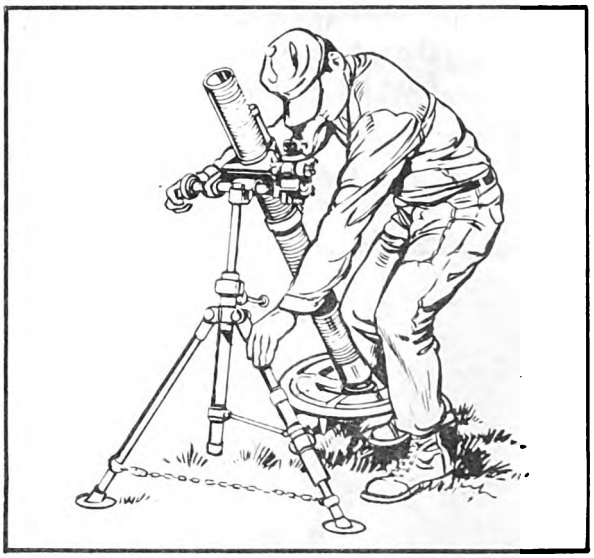

Figure 12.

(k) After making fine adjustments, the gunner steps away from the mortar and announces "UP" (figure 12).

(l) The mortar is now mounted.

6. The squad leader checks the mortar for the following:

a. Correct sight settings for deflection and elevation (no tolerance).

b. Bubbles on sight are level (within outer red lines).

c. Vertical crossline is no more than two mils off the left edge of the directional stake.

d. Traversing bearing is no more than two turns to the left or right of center.

e. Barrel is locked to baseplate.

f. Baseplate is positioned correctly in relation to baseplate stake.

NOTE: The procedure for placement of the baseplate is the same in training or in combat except, in combat, the squad leader indicates where the mortar is to be mounted by placing the sightcase where he wants the mortar mounted. He then points in the direction the mortar is to be mounted. The baseplate is set close to the sightcase in the same manner as with the baseplate stake.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 61, para 74; page 88, para 103d)

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TASK NUMBER: 071-321-3902

BORESIGHT 81-MM MORTAR

CONDITIONS:

You are the gunner on an 81-mm mortar, given a mounted 81-mm mortar complete with M53 or M34A2 sight, M45 boresight, screwdrivers, an aiming stake for use as a direction stake, and an assistant gunner.

STANDARDS:

Boresight the 81-mm mortar within 5 minutes using either of the methods listed below:

1. Distant Aiming Point: Both the sight unit and the boresight will be alined on the same aiming point (at least 200 meters from mortar) and all bubbles level. The sight will have a deflection of 3200 mils (+ or - 1 mil) (the M34A2 sight deflection is 0 mils) and an elevation of 0800 mils (+ or - 1 mil). Mortar will not be more than two turns from center traverse.

2. Boresight Box: Boresight box will be approximately 25 meters from the mortar with the vertical crossline of the mortar sight alined on left edge of boresight box and the boresight vertical crossline alined on the right side of boresight box and all bubbles level. The M53 sight will have a deflection of 3200 mils (+ or - 1 mil) (0 mils for M34A2 sight), and an elevation of 0800 mils for elevation. Mortar will not be more than two turns from center traverse.

PERFORMANCE MEASURES:

1. **Preparing the 81-mm mortar for boresighting with the M45 boresight.**

a. Mount mortar and place a deflection of 3200 mils on the M53 sight (0 mils on the M34A2) and 0800 mils elevation and level bubbles.

b. Place M45 boresight on mortar and level bubbles (figure 1).

2. **Elevation setting:** Check elevation bubble on sight. If not level:

a. Turn elevation knob on sight and level elevation bubble.

b. Loosen elevation scale, slip scale until it reads 0800, and secure.

c. Loosen elevation micrometer scale, slip scale until it reads 0, and secure.

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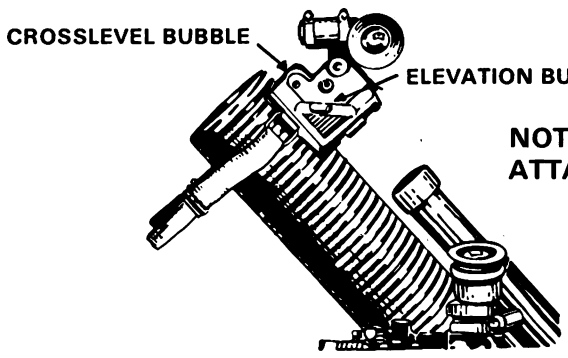

Figure 1.

NOTE: M125A1 mortar carrier cannot be on more than a 5-degree slope to boresight for elevation.

3. **Deflection setting:** Check to insure the sight setting reads 3200 on fixed deflection (red) scale (0 on M34A2).

a. Distant aiming point method of boresighting.

(1) Pick an aiming point at any distance but no less than 200 meters from mortars.

(2) Aline vertical crossline of boresight on aiming point, insuring bubbles on boresight are level.

(3) Aline vertical crossline of sight on same edge of aiming point, using micrometer knob only (insure all bubbles are level).

(4) If the deflection reading is not 3200 mils for the M53 or 0 for the M34A2 sight, loosen the screws on the base of the micrometer knob and slip scale to read 3200 or 0 and retighten screws.

b. Using the boresight box method of boresighting.

(1) Place boresight case perpendicular to the mortar, 25 meters from the mortar (assistant gunner).

(2) Aline right side of boresight box on vertical crossline of boresight by sliding it left or right.

(3) Aline vertical crossline of sight on left side of boresight box using the micrometer knob only (insure all bubbles are level).

(4) If the reading on the micrometer scale is not reading 0, loosen the screws in the base of the micrometer knob and slip the scale to 0 and retighten screws.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 27, para 31-32 and para 35)
TEC Lesson 010-071-6635, Prepare to Fire; Boresighting 81-mm Mortar

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TASK NUMBER: 071-321-3903

PERFORM SAFETY CHECKS ON 81-MM MORTAR (GROUND- OR CARRIER-MOUNTED)

CONDITIONS:

You are the gunner or acting gunner on an 81-mm mortar. Given a mounted 81-mm mortar complete with sight and an assistant gunner.

STANDARDS:

Within 5 minutes, make pre-fire safety checks IAW the performance measures below.

PERFORMANCE MEASURES:

1. **Check for MASK and OVERHEAD clearance as follows:**

a. To determine **mask** clearance, lower tube to 0800 elevation and sight along top of the barrel with eye placed near baseplate.

b. To determine **overhead** clearance, raise the tube to 1500 elevation and sight along top of the barrel with eye near baseplate.

NOTE: If full range of elevation cannot be obtained, raise or lower barrel until rounds will clear obstruction, turn elevation knob on sight until bubble is level, read the elevation, and report it to squad leader.

2. **Check the ground-mounted mortar (FM 23-90, page 58, para 65) to insure:**

a. The barrel is locked to the baseplate and open end of the socket cap is pointing in the direction of fire.

b. The shock absorber clevis lock pin is secured to the mount attachment ring on the cannon assembly.

c. The locking nut on the bipod leg is hand-tight.

d. The spread chain is doubled, taut, and hooked to left leg.

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3. **Check the carrier-mounted mortar (FM 23-90, page 76, para 94) to insure:**

a. The barrel is locked in the socket.

b. The buffer clevis lock pin is secured to the mount attachment ring on the cannon assembly.

c. The bipod assembly is locked in bipod support.

d. The hatch covers are open and secure.

e. Turntable locking lever is in the locked position.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72
TM 9-2300-257-10, Operator's Manual, Carrier, Personnel, Full Tracked, Armored, M113, Feb 69 (chap 2, page 2-119, para 2-148)
TEC Lesson 010-071-6634, Prepare to Fire; Mounting and Prefire Safety Checks

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TASK NUMBER: 071-321-3904

LAY MORTAR FOR DEFLECTION AND ELEVATION (D&E) (GROUND-/CARRIER-MOUNTED)

CONDITIONS:

You are the gunner for an 81-mm mortar, given the following:

1. A mounted 81-mm mortar; a sight set on 2800 mils deflection, 1100 mils elevation with bubbles level; aiming posts placed out on referred deflection of 2800 mils; and an assistant gunner.

2. A small D&E change (more than 20 mils but less than 60 mils for deflection, and more than 35 mils but less than 90 mils for elevation).

3. A large D&E change (more than 200 mils but less then 300 mils for deflection, and more than 100 mils but less than 200 mils for elevation).

STANDARDS:

1. For small D&E changes: Within 35 seconds, mortar must be correctly laid for deflection and elevation so that the D&E is the same as given in the initial fire command, both bubbles on sight are level, and vertical crossline of the sight is 2 mils or less from the left edge of the aiming post.

2. For large D&E changes: Within 60 seconds, mortar must be correctly laid for deflection and elevation so that the D&E is the same as given in the initial fire command, both bubbles on sight are level, vertical crossline of the sight is no more than 2 mils off the compensated sight picture, and the traversing mechanism is not more than two turns to the left or right of the center position.

PERFORMANCE MEASURES:

1. **For small D&E changes (ground-/carrier-mounted):**

a. Mortar is placed into action and sight laid on aiming posts with a referred deflection of 2800 mils and 1100 mils elevation.

b. Gunner is given a D&E change in the form of an initial fire command.

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c. As soon as data is announced, the gunner places it on the sight, lays for elevation, and then traverses onto aiming posts.

d. When gunner is satisfied with his sight picture (figure 1) and all bubbles are level, he announces "UP."

e. Squad leader checks gun.

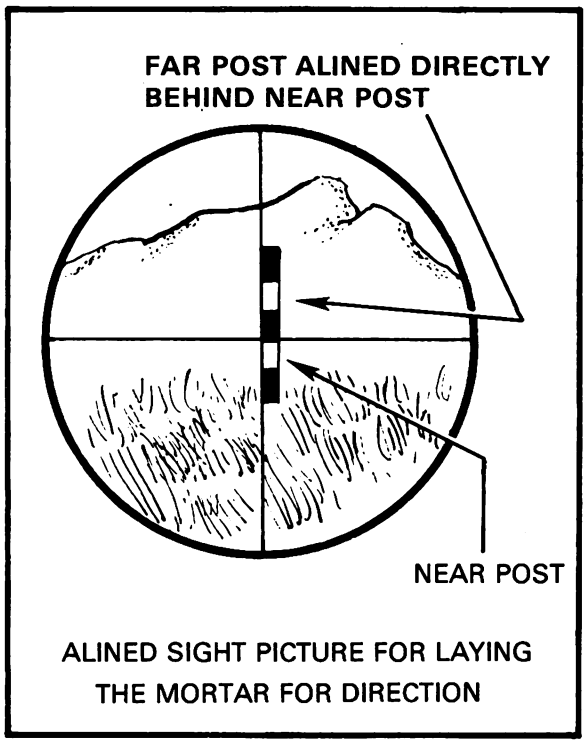

Figure 1.

Figure 2.

2. **For large D&E changes (ground-mounted mortar) (FM 23-90, page 62, para 75-76).**

a. Mortar is mounted and sight laid on aiming posts with a referred deflection of 2800 mils and 1100 mils elevation.

b. Gunner is given a D&E change in the form of an initial fire command.

c. As soon as data is announced, the gunner places it on the sight, elevates the mortar, and centers the traversing bearing.

d. Assistant gunner positions himself in front of bipod and lifts bipod until it clears the ground (figure 2).

e. Gunner moves mortar and alines sight approximately on aiming posts (figure 2).

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f. Gunner levels mortar and takes up proper compensated sight picture (figure 3).

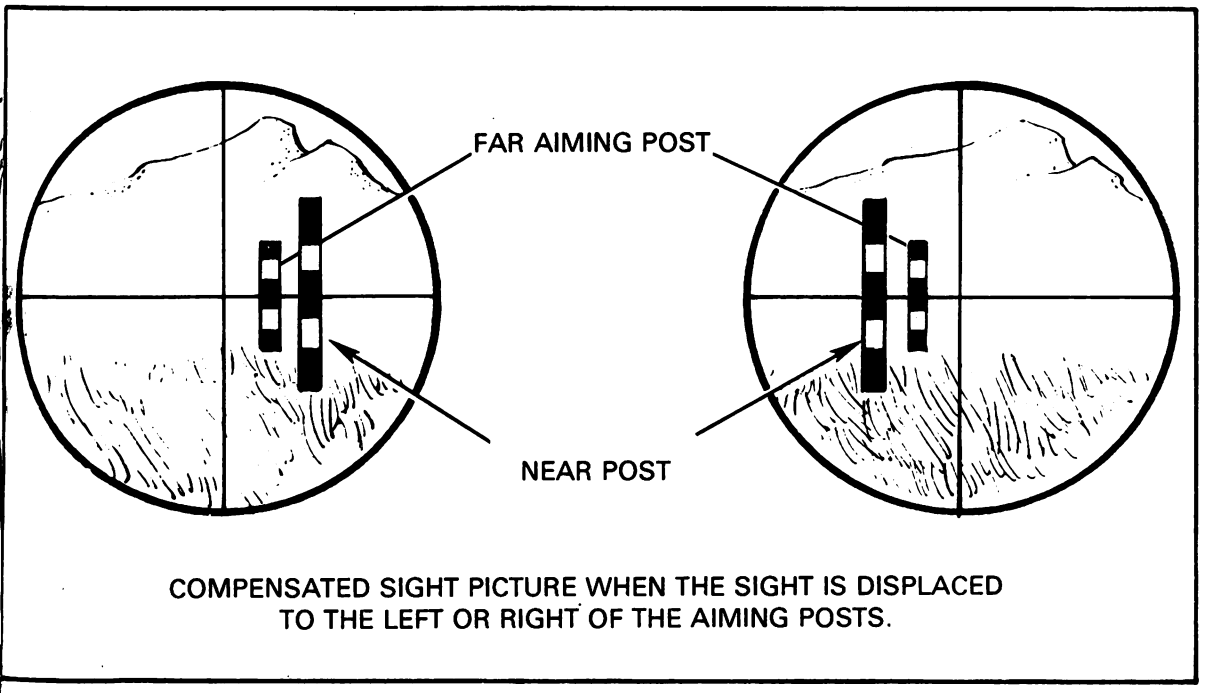

Figure 3.

g. Squad leader checks gun for correct lay.

NOTE: All elements of the fire command are repeated by the gunner.

3. For large D&E changes (carrier-mounted) (FM 23-90, page 76, para 94).

a. Mortar is placed into action and sight laid on aiming posts with a referred deflection of 2800 mils and 1100 mils elevation.

b. Gunner is given a D&E change in the form of an initial fire command.

c. As soon as data is announced, the gunner places it on the sight, elevates the mortar, and centers the traversing bearing.

d. Assistant gunner unlatches traverse locking handle, gunner and assistant gunner rotate turntable, assistant gunner locks turntable in position (figure 4).

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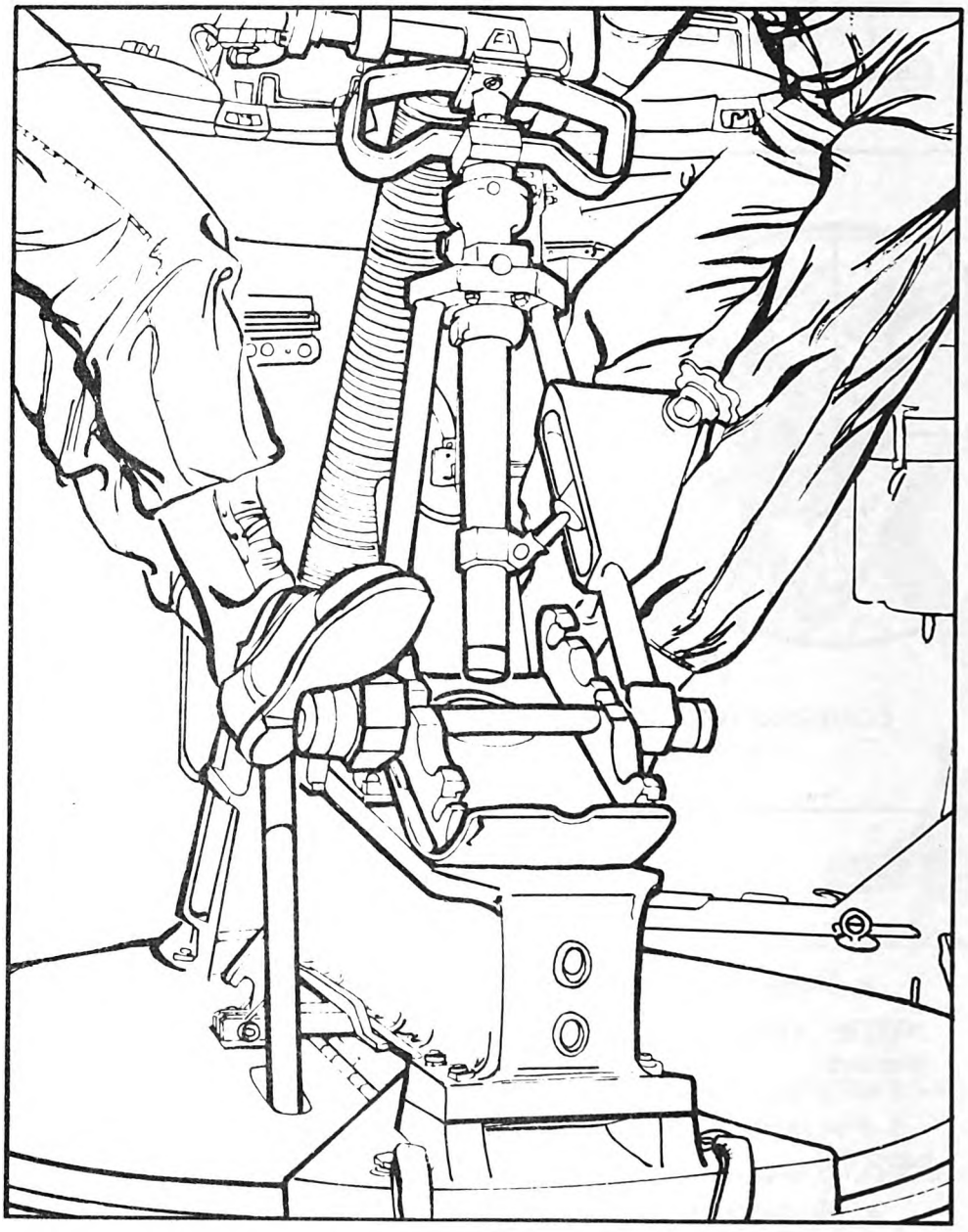

Figure 4. Gunner and assistant gunner rotating the turntable.

e. Gunner levels mortar and takes up proper compensated sight picture (figure 3).

f. Squad leader checks gun for correct lay.

NOTE: All elements of the fire command are repeated by the gunner.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72

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TASK NUMBER: 071-321-3905

PREPARE 81-MM MORTAR AMMUNITION FOR FIRING

CONDITIONS:

You are the ammunition bearer on the 81-mm mortar. Given an M25 fuze setter, M18 fuze wrench, strap wrench, and any of the following type rounds and fuzes:

TYPE ROUND	TYPE FUZE
M374A2 (HE) w/fuze	M524A5, M532
M374A2 (HE) w/o fuze	M532, M524A5
M375A2 (WP)	M524A5, M532
M301A2 (A3) Illum	M84A1

Type round, charge, fuze, and fuze setting will be given in the form of an initial fire command.

STANDARDS:

Within 1 minute after the FDC gives the initial fire command, select the correct round, set the fuze (when applicable) and charge for the fire command given, IAW performance measures below.

PERFORMANCE MEASURES:

1. **Identification of Rounds** (figure 3):

   a. High explosive -- OD w/yellow markings.

   b. White phosphorus -- light green w/red markings.

   c. Illumination -- white w/black markings.

NOTE: Each round is stenciled with type model of round. (Example: M374, High Explosive; M375, White Phosphorus; M301A3, Illumination).

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2. **Setting Fuzes:**

a. M524A5 (figure 1):

(1) To prepare for firing, turn the slot in the striker to aline with the SQ index for "super quick" or D index for "delay" on the fuze body, depending upon which action of fuze is desired.

(2) Remove safety pull wire which will remove both safety pins, just prior to insertion of round into the mortar.

(3) The M524A5 will not arm for a minimum of 1.25 seconds after firing, but will arm within a maximum of 2.5 seconds after firing.

NOTE: If, upon removal of the pull wire, a buzzing sound in the fuze is heard, the cartridge should not be used. Such a cartridge is still safe to handle and transport provided the safety wire is reinserted.

WARNING: IF THE PLUNGER SAFETY PIN (UPPER PIN, FIGURE 1) CANNOT BE REINSERTED, THE FUZE MAY BE ARMED. AN ARMED FUZE MUST NOT BE FIRED SINCE IT COULD FUNCTION PREMATURELY. IT SHOULD BE HANDLED WITH EXTREME CARE AND EOD PERSONNEL NOTIFIED IMMEDIATELY. DEPRESSION OF STRIKER (FUZE POINT) OR ANY MOVEMENT OF CARTRIDGE WHICH WOULD CAUSE THE PLUNGER TO MOVE FORWARD AGAINST THE CREEP SPRING MAY CAUSE THE DETONATOR TO MOVE FORWARD AGAINST THE FIRING PIN, RESULTING IN DETONATION OF THE CARTRIDGE. IF HANDLING OF A CARTRIDGE WITH A SUSPECTED ARMED FUZE IS ABSOLUTELY NECESSARY, THE CARTRIDGE MUST BE HELD VERTICALLY WITH THE FUZE STRIKER ASSEMBLY UP.

b. M532 (Proximity) (figure 2):

(1) To prepare the M532 fuze for firing, it must be placed on the round as there are no rounds manufactured with the M532 fuze attached.

(2) To attach the fuze to the round, use the M18 fuze wrench and the strap wrench. Insert the fuze (with wavy washer in position); use the M18 wrench to tighten the fuze to the body so that no clearance exists between the fuze and the body of the projectile.

(3) This fuze will provide an air burst 1 to 6 meters above the target, depending on angle of fall. The lower the angle of fall, the higher the burst (up to 6 meters). The higher the angle of fall the lower the burst (down to 1 meter).

(5) The round can be converted to PDSQ by rotating the top portion of the fuze 1/3 turn in either direction which will break the external shear pin and internal wiring. There is no delay capability for this fuze.

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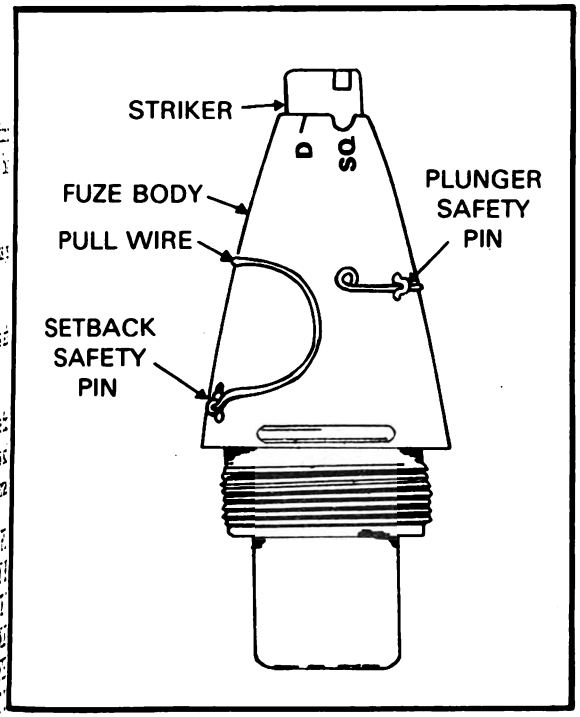

Figure 1.

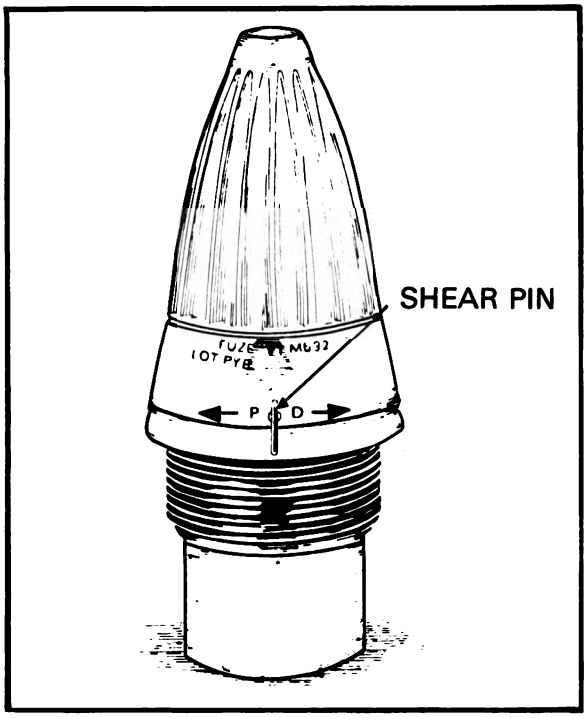

Figure 2.

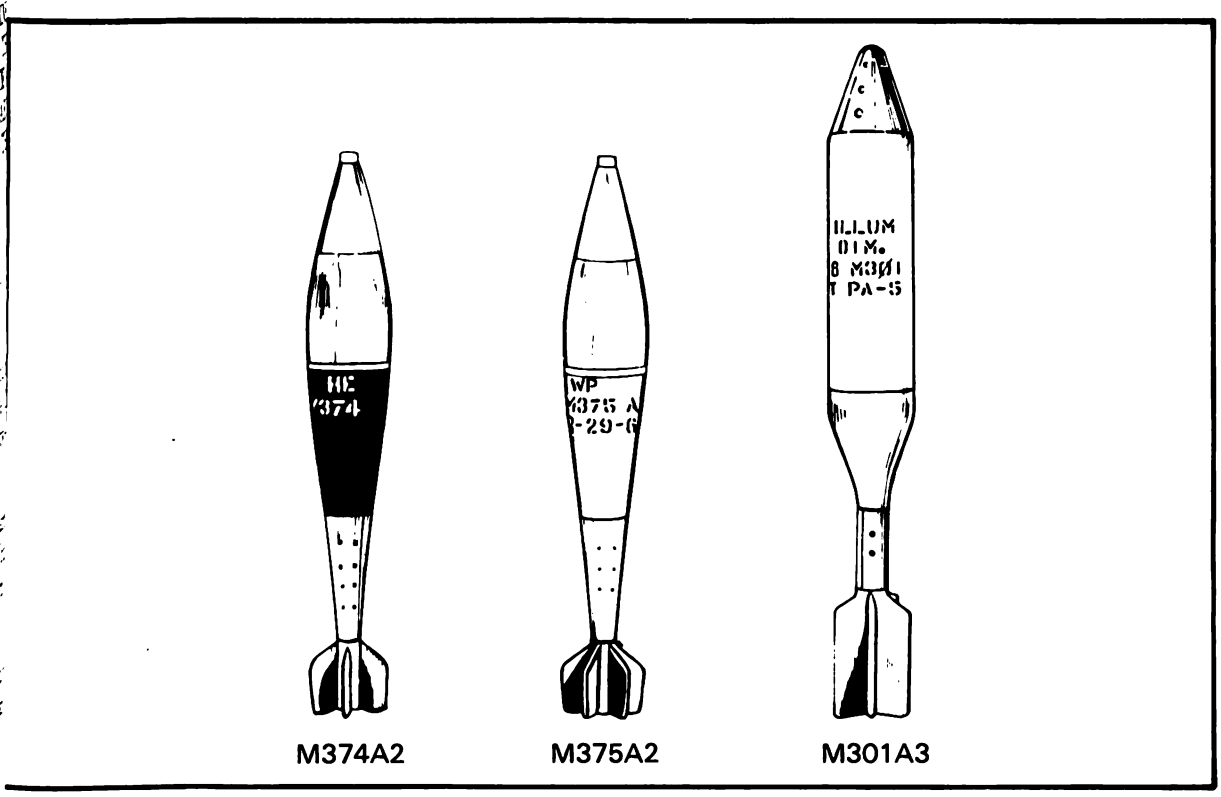

Figure 3. Standard "A" 81-mm mortar ammunition.

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c. M84 and M84A1:

(1) This is a time fuze that can be set to function at any time in seconds from time of firing.

(a) The M84 has a time scale numbered from 0 to 25 seconds in 1-second intervals.

(b) The M84A1 has a scale numbered from 0 to 50 seconds in 2-second intervals.

(2) The M25 fuze setter is used to set the time by placing over the 6 raised ribs on the fuze and turning counterclockwise until correct time is indexed.

NOTE: If the time setting has been passed, DO NOT turn fuze back. Continue turning counterclockwise and start over.

3. **Setting Charges:** The charge given in the fire command is the number of charges to remain on the round. To remove charges, unbutton each increment (charge) and insure that all charges removed are not taken from one side. When firing charge 1, use only the yellow spiral charge; charges 2 through 9 are white.

4. **All rounds and fuzes should be inspected for serviceability prior to firing.**

CAUTION: DURING TRANSPORTING OF MORTAR AMMUNITION IN MORTAR CARRIERS, ROUNDS WILL BE STORED IN AMMO RACKS IN THEIR FIBER CONTAINERS WITH SEALS UNBROKEN. DURING FIRING, ONLY THE NUMBER OF ROUNDS REQUIRED FOR THE MISSION WILL BE PREPARED FOR IMMEDIATE EXPENDITURE. PROTECT THE PROPELLING CHARGES AND IGNITION CARTRIDGE OF THESE ROUNDS BY SLIPPING ONE END OF A FIBER CONTAINER OVER THE BASE OF THE ROUND. UNUSED ROUNDS WILL BE REPACKED AND UNUSED CHARGES WILL BE KEPT IN A CONTAINER (AMMO BOX) WITH LID CLOSED AND DISPOSED OF IN ACCORDANCE WITH UNIT SOP.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 7 thru 16, para 8 thru 15)
TEC Lesson 010-071-6638, 81-mm Mortar Ammunition

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TASK NUMBER: 071-321-3906

PERFORM OPERATOR MAINTENANCE ON 81-MM MORTAR AND ASSOCIATED FIRE CONTROL EQUIPMENT

CONDITIONS:

You are a member of an 81-mm mortar crew, given an 81-mm mortar complete, sight, aiming post light, sight light, M45 boresight, and special tools and equipment listed in FM 23-90, chapter 1, section IV, and in TM 9-1015-200-12.

STANDARDS:

Inspect, clean, spot paint, and lubricate the mortar IAW the performance measures below and the procedures outlined in FM 23-90, chapter 1, section IV, page 43. For defective items that cannot be corrected by the operator, or if the bipod assembly or sight assembly have been immersed in water, notify organizational maintenance personnel immediately.

PERFORMANCE MEASURES:

1. **General maintenance required on the 81-mm mortar:**

a. Inspection of all parts for cracks, excessive wear, and rust. Moving parts are lightly lubricated and operate smoothly; parts that are loose, tightened. Rust is removed with crocus cloth.

b. Spot painting of parts that are painted.

c. Nameplates and serial numbers are coated with clear lacquer.

d. At least once every 6 months, check for application of modification work orders.

2. **Muzzle cover and shoulder pad:**

a. Check for loose grommets, loose buckles, rips, mildew, rotting, and oil, grease, and dirt.

b. Remove mildew with a dry brush. Remove oil, grease, and dirt on shoulder pad with soap and warm water; rinse with clear water. Clean muzzle cover with saddle soap; when dry, apply neat's-foot oil.

3. **Barrel assembly:**

a. Inspect for dirt and carbon, and for cracks/dents/bulges; remove firing pin and check for cracks/wear. Check color graduation marks; should be 1½ inches long, and located 17 and 21 inches from muzzle.

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b. Remove dirt with rags, and carbon with rifle bore cleaner; as necessary, repaint graduation marks.

c. Oil barrel and bore; paint graduation marks.

4. **Bipod assembly:**

a. Check for cleanliness and insure that --

(1) Sliding bracket grips bipod leg firmly when locking nut is tightened.

(2) Adjusting nut precisely controls the crosslevel and has a minimum of looseness.

(3) Elevating mechanism operates up and down smoothly.

(4) Traversing spindle operates smoothly over entier range in both directions.

(5) Shock absorber clevis returns to normal position, when pulled out.

b. Clean with dry rags.

c. Lubricate with oily cloth; oil internal parts of elevating and traversing mechanisms.

5. **Baseplate assembly, M23A1 and M3:**

a. Check the M23A1 for scratched or chipped surface, bent or broken ribs; check socket for smooth operation; check latches for locking action and check the assembly for overall cleanliness.

b. Check the M3 for scratched or chipped surface, bent or broken ribs; check socket for smooth operation and check the assembly for overall cleanliness.

c. Clean with rags and spot paint as necessary.

d. Lubricate moving parts.

NOTE: Notify your immediate supervisor and the organizational mechanic if you detect a defective item which cannot be corrected by cleaning, lubrication, spot painting, or adjustment, or if the following items have been immersed in water:

a. Elevating mechanism (bipod).

b. Traversing mechanism (bipod).

c. Shock absorber (bipod).

d. Optical parts (sight).

6. **Sighting and fire control equipment:**

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a. Inspect all items for cracks, excessive wear, broken parts, and rust. Moving parts, to exclude switches, are lightly lubricated and operate smoothly. Rusted areas are cleaned with crocus cloth and then are spot painted if on a painted surface.

b. Insure nameplates and serial numbers are coated with clear lacquer.

c. Sight unit:

(1) Lenses should be clean and dry; dovetail bracket free of burrs or dents, knobs operate smoothly; deflection/elevation scales are dry.

(2) Remove dust from lenses with camel's hair brush; wipe each lens with lens cleaning tissue. Remove grease or oil from the lens with lens cleaning compound. Remove oil from the deflection/elevation scales with clean, dry rags.

(3) Lubricate sight locking devices with light oil (LSA).

d. Instrument light (M53 or M42):

(1) Rheostat knob should operate smoothly and remain at desired setting; battery case is dry and free of corrosion and rust; light bulbs function; cables have not deteriorated and have no broken insulation.

(2) Remove rust from battery contacts with crocus cloth; remove corrosion with toothbrush and rags; wipe cables with clean, dry rags.

e. Aiming post light, M14:

(1) Battery case should be dry and free of corrosion and rust; light bulb should function; switch operates smoothly and locks at desired setting; filters should be clean; clamp holds unit firmly to aiming post and is not bent out of shape.

(2) Remove rust from case with crocus cloth; remove corrosion with toothbrush and rags; dry entire item with rags; clean filters with lens tissue.

f. Aiming post, M1A2:

(1) Check for proper fit; joints should not be dented out of shape; check for cleanliness and scratched or chipped body.

(2) Clean with dry rags; sand chipped paint with crocus cloth and repaint as necessary.

g. Carrying case: Check rubber seal; insure that latches are tight and not bent or broken; check case for cleanliness and scratched or chipped parts.

NOTE: All of the above maintenance applies to the carrier-mounted mortar with the addition of checking and greasing the indexing gears and locking lever for the turntable.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 43, para 39-50)
TEC Lesson 010-071-6640, 81-mm Mortar Maintenance

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TASK NUMBER: 071-321-3907

REMOVE A MISFIRE FROM THE 81-MM MORTAR (GROUND-MOUNTED)

CONDITIONS:

Given you are the gunner on an 81-mm mortar and your team is conducting a fire mission in support of your unit. You will be assisted in performing this task by an assistant gunner and an ammunition bearer.

NOTE: For training purposes a training cartridge M68 or a wooden dummy round may be used.

STANDARDS:

Perform misfire procedures within 7 minutes, IAW performance measures below.

PERFORMANCE MEASURES:

1. If a misfire occurs during the course of a fire mission, the first crew member who notes the misfire announces in a loud voice, "MISFIRE."

2. BEFORE taking any actions to remove the misfired mortar round from the cannon (barrel), all crew members except the gunner will move to the rear of the mortar position a safe distance (training — 50 meters).

3. Immediate action for a misfire.

a. After the crew has moved to a safe position, the gunner moves to the rear of the mortar and kicks the cannon several times to dislodge the round if it should be hanging in the cannon somewhere between the muzzle and the firing pin (figure 1).

b. If the round does not fire after the cannon is kicked, the gunner will move to the rear and join the rest of the crew. The gunner will then wait 1 minute. (This 1-minute wait is to allow the round to fire should there be a delayed action of the propelling charge.)

c. If the round fires after performing either step 3 a or b, the gunner relays on the target and continues the fire mission.

d. If the round does not fire after performing 3 a and b above, the gunner returns to the mortar and performs the following:

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(3) While the assistant gunner is coming forward, the gunner will remove the sight, lay it out of the way, and depress the cannon to its lowest elevation (this makes the mortar easier to handle).

4. In removing the misfired round from the cannon, the following action will take place.

a. The assistant gunner will move to the right of the mortar and brace the right leg of the mortar by placing his left leg in front of it (figure 3a).

b. He will then place his hands on the cannon near the muzzle, left hand on top, the right hand under the cannon.

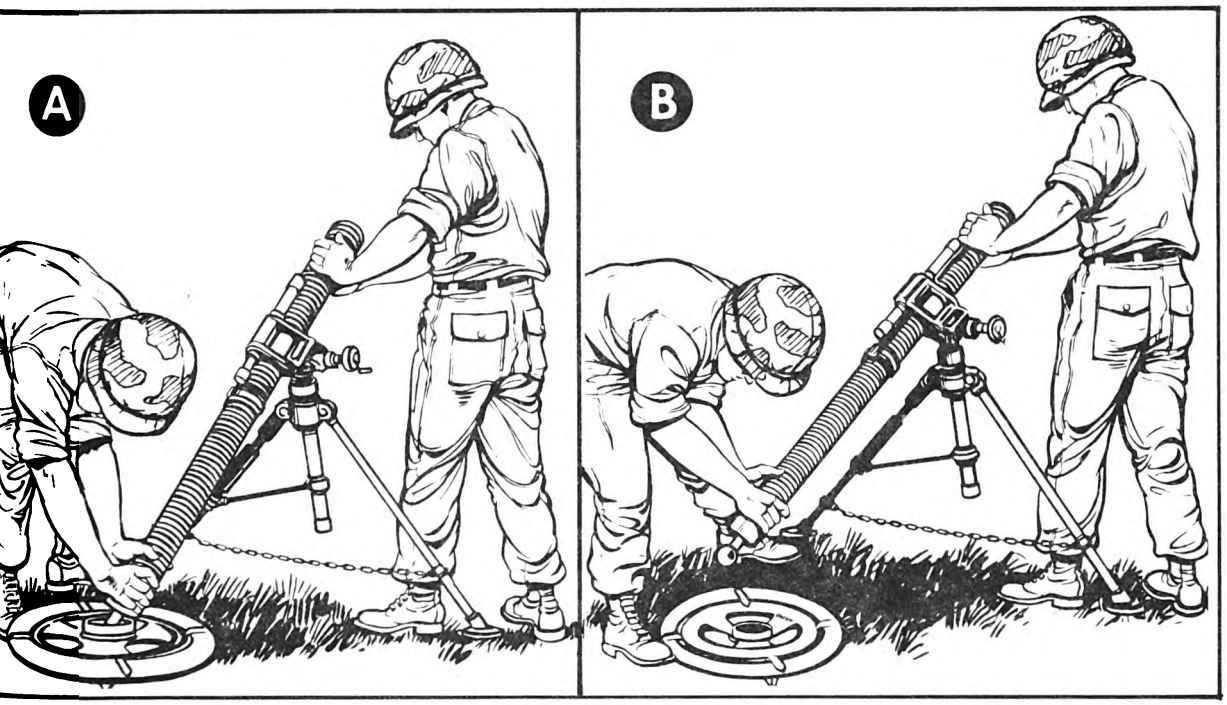

Figure 3.

c. The gunner, standing to the left of the mortar, will reach down and unlock the cannon from the baseplate by giving it a ¼ turn (figure 3a).

d. When the gunner is sure the assistant gunner is ready, he will slowly and smoothly raise the cannon to a horizontal position (figure 3b and 4).

e. At this point the assistant gunner will slip his thumbs slightly over the edge of the muzzle to stop the round as it slides out (figure 5).

f. The gunner will now continue to raise the cannon until the round slides out and is caught by the assistant gunner (figure 6 & 7).

g. The round is then passed to the ammo bearer who has joined the gunner and assistant gunner at the mortar.

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Figure 4.

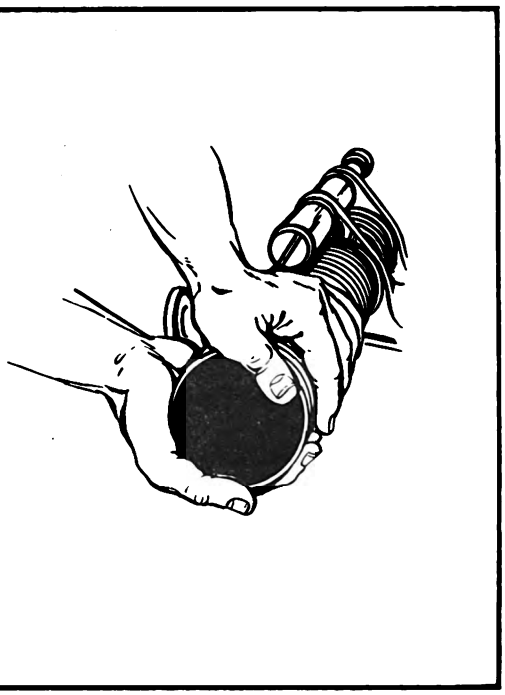

Figure 5.

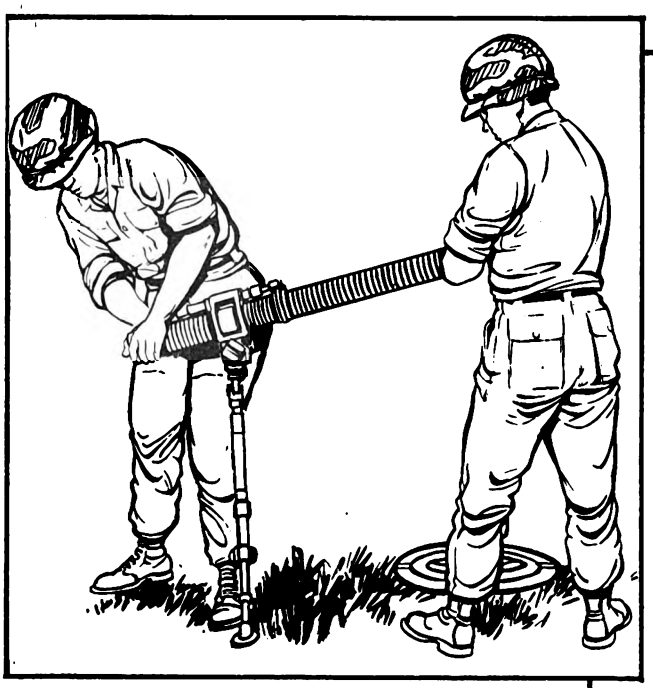

Figure 6.

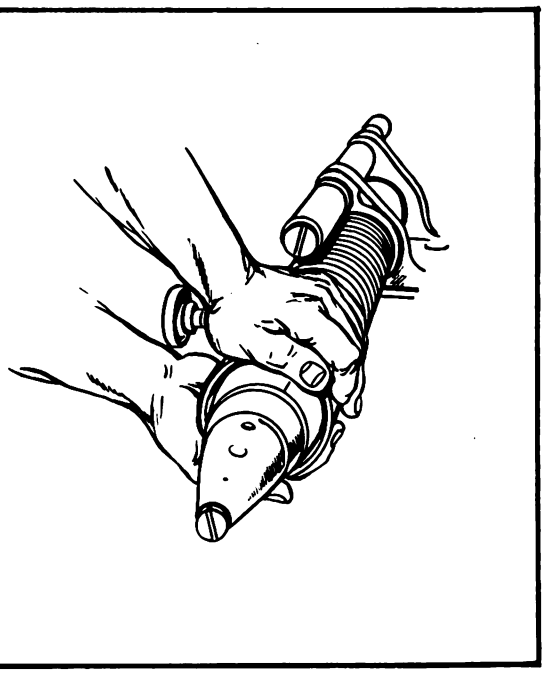

Figure 7.

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h. After receiving the round, the ammo bearer will attempt to replace the safety pins.

(1) If the safety pins can be replaced, the round is then inspected to determine the cause of the misfire. If the ignition cartridge has not struck the firing pin and no other cause can be found, the crew, after re-laying the mortar, will attempt to refire the round.

(2) If the safety pins cannot be replaced in the fuze, the round will be placed in the DUD PIT and disposed of according to unit SOP.

i. While the ammo bearer is inspecting the round, the gunner and assistant gunner will place the mortar back into action by doing the following:

(1) The gunner will raise the cannon as high as possible and shake it to remove any trash or foreign objects from the bore.

(2) He lowers the cannon and locks it to the baseplate.

(3) He replaces the sight and re-lays the mortar.

(4) The assistant gunner will then swab the bore.

j. The mortar crew is now ready to continue the mission.

NOTE: If the round is lodged and will not slide out when the cannon is raised, the cannon will be removed from the bipod. Keeping the muzzle down range, place the cannon in the DUD PIT and follow unit SOP for this situation.

4. Listed below is a short summary of what each crew member must do.

GUNNER	ASSISTANT GUNNER	AMMO BEARER
1. Tests barrel for heat and calls assistant gunner forward.		
2. Removes sight and places in sight box.		
3. Depresses barrel to minimum elevation.	Braces right leg of bipod.	

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GUNNER	ASSISTANT GUNNER	AMMO BEARER
4. Unlocks barrel from baseplate.	Places hands near muzzle; right hand palm up, left hand palm down.	
5. Lifts barrel to horizontal.	Places thumbs over muzzle.	
6. Continues to raise barrel until round starts to move.	Stops round, removes it, and hands it to ammo bearer.	Attempts to replace safety pins and inspects round to determine cause of misfire.
7. Shakes barrel to dislodge remnants of last round.		
8. Locks barrel to baseplate.	Swabs bore.	
9. Replaces sight and relays on last data given.		

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 2, page 59, para 67-69)
TEC Lesson 010-071-6639, Misfire Procedures

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TASK NUMBER: 071-321-3909

REFER SIGHT AND REALINE AIMING POSTS

CONDITIONS:

You are the gunner on an 81-mm mortar. Given a mounted 81-mm mortar complete with sight and aiming posts out on a deflection of 2800 and two assistants to act as assistant gunner and ammo bearer.

STANDARDS:

Within 75 seconds, realine aiming posts IAW the performance measures below.

PERFORMANCE MEASURES:

1. **To refer the sight and realine the aiming posts, the following actions take place:**

a. The mortar is mounted and alined on the aiming posts with a deflection of 2800 and elevation 1100, all bubbles level.

b. When the gunner is ready to start he will be given an administrative fire command to move the mortar from center of traverse. This command will contain a deflection between 2860 and 2740. (Example: "Number two, deflection 2760, elevation 1100.")

c. The gunner will place the data on the sight, and re-lay on the aiming posts using the traversing handwheel (bipod will not be shifted).

d. When the mortar has been relaid with the new deflection, elevation and all bubbles level, the gunner will be given a new fire command. (Example: "Deflection 2775, refer, realine aiming posts.")

e. Upon receiving this last fire command, two actions take place:

(1) The ammo bearer will move out on the double to realine the aiming posts on the new deflection. As he arrives at the near aiming post he will knock it down and continue on to the far post. There he will await the signals from the gunner (figure 1).

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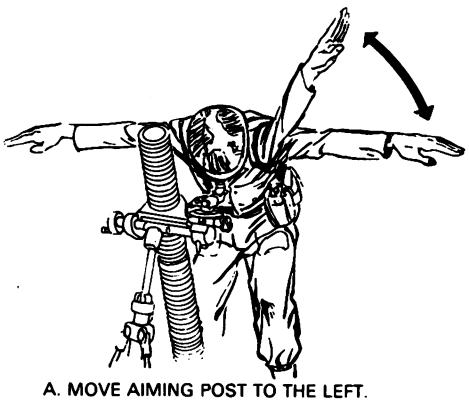
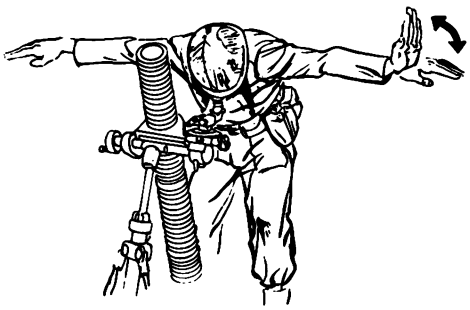
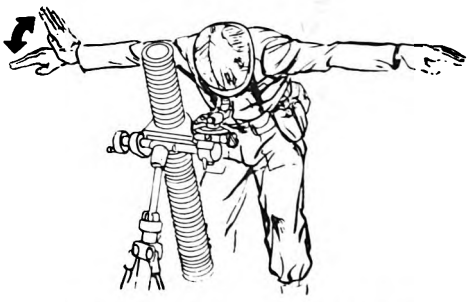


A. MOVE AIMING POST TO THE LEFT.

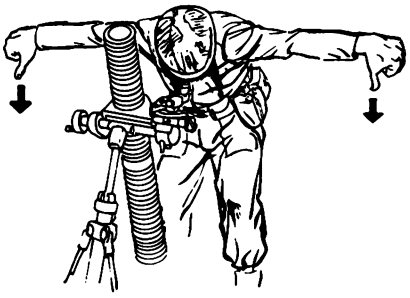
B. MOVE AIMING POST TO THE RIGHT.



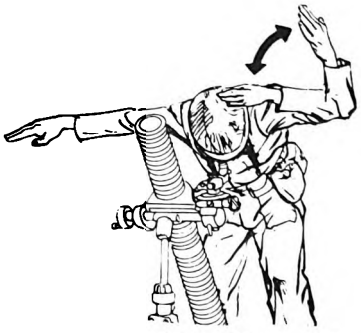
C. MINOR MOVEMENT OF THE POST TO THE LEFT.



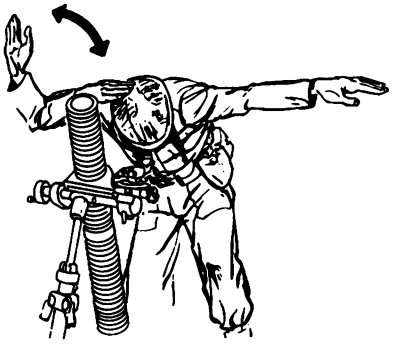
D. MINOR MOVEMENT OF THE POST TO THE RIGHT.



E. DRIVE IN POST.



F. TILT POST TO THE LEFT.



G. TILT POST TO THE RIGHT.

H. POST INCORRECT START OVER.

I. POST CORRECT.

Figure 1.

2-VIII-A-8.2

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(2) The gunner, without disturbing the lay of the mortar, will place the new deflection on the sight using the deflection micrometer knob.

f. After the gunner has placed the data on the sight and the ammo bearer is at the far aiming post, the gunner will aline the aiming post using arm-and-hand signals until he has an alined sight picture. The ammo bearer will move to the near post and the process will be repeated.

g. As soon as the aiming posts are alined, the gunner will center the traversing bearing and, with the help of the assistant gunner, shift the bipod and re-lay on the aiming posts.

h. After the mortar is relaid on the aiming posts and all bubbles are level, the gunner steps away from the mortar and announces "UP."

NOTE: The time will begin with the command "REFER, REALINE AIMING POSTS" and end when the gunner announces "UP."

2. **After the gunner announces "UP," the mortar will be checked for the following:**

a. Time did not exceed 75 seconds.

b. Traversing handwheel was not turned before the aiming posts were realined.

c. Sight is correctly set for deflection and elevation.

d. Vertical crossline is not more than 2 mils off the left edge of the aiming posts.

e. Traversing bearing is not more than 2 turns right or left of center.

f. Bubbles on sight are level (within outer red lines).

REFERENCES:

FM 23-90, 81-mm Mortar, C1, 25 Feb 72 (page 64, para 77; page 90)
TEC Lesson 010-071-6637, Prepare to Fire; Referring Sight and Placing Aiming Posts

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TASK NUMBER: 071-321-3910

RECIPROCALLY LAY MORTAR USING M2 AIMING CIRCLE AND PLACE OUT AIMING POSTS

CONDITIONS:

Given an 81-mm mortar mounted on an initial azimuth with sight set on a deflection of 3200 for M53 sight (or 0 for M34A2 sight) and 1100 mils elevation; mortar laid on a direction stake with the traversing mechanism centered; assistant gunner, ammo bearer, and aiming posts; a prepared M2 aiming circle; and an operator (to give commands). The mounting azimuth will not be less than 150 mils nor more than 200 mils away from the initial azimuth.

STANDARDS:

1. Reciprocally laying mortars: Within 115 seconds, the sight will be set on last deflection given, 1100 mils elevation, and bubbles level. The vertical line of sight will be within 1 mil of the center of the head of the aiming circle.

2. Placing out aiming posts: Within 2 minutes from the command, "DEFLECTION 2800, REFER, PLACE OUT AIMING POSTS," the gunner will aline both aiming posts on a deflection of 2800 mils, so that only the near post can be seen. The vertical crossline of the sight will be alined on the left edge of the near stake. The far aiming post will be approximately 100 meters from mortar and the near post half the distance between mortar and far post.

PERFORMANCE MEASURES:

1. **To reciprocally lay mortar:**

a. The mortar will be mounted and laid on direction stake with sight set on 3200 mils deflection and 1100 mils elevation.

b. M2 aiming circle (AC) operator prepares aiming circle on azimuth of not less than 150 mils nor more than 200 mils from initial azimuth.

c. AC operator gives command **"AIMING POINT THIS INSTRUMENT."** (Figure 1.)

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e. AC operator announces deflection (example: **"NUMBER ONE, DEFLECTION, 2315").**

f. Gunner places data on sight using red scale and re-lays on center of AC's head, and announces "READY FOR RECHECK."

g. AC operator gives new deflection and process is repeated until gunner announces "NUMBER ONE, ZERO (OR ONE) MILS, MORTAR LAID."

NOTE: In laying a carrier-mounted mortar, if the first deflection given by the AC operator would cause the turntable and mortar to be moved from center of indexing gear, the carrier is shifted and the ammo bearer may repeat the message to overcome engine noise during exchange of deflections.

2. To place out aiming posts:

a. As soon as the gunner announces **"ZERO (OR ONE) MILS, MORTAR LAID,"** the AC operator gives the command **"SECTION, DEFLECTION 2800, REFER, PLACE OUT AIMING POSTS."**

b. Gunner refers sight using deflection micrometer knob and indexes 2800 deflection on the red scale (this will move only the sight without moving the barrel).

c. Ammunition bearer moves out with aiming posts (100 meters far post; 50 meters near post).

d. Gunner directs ammunition bearer in placing out the aiming posts using arm-and-signals (figure 3) so he has an alined sight picture (figure 4).

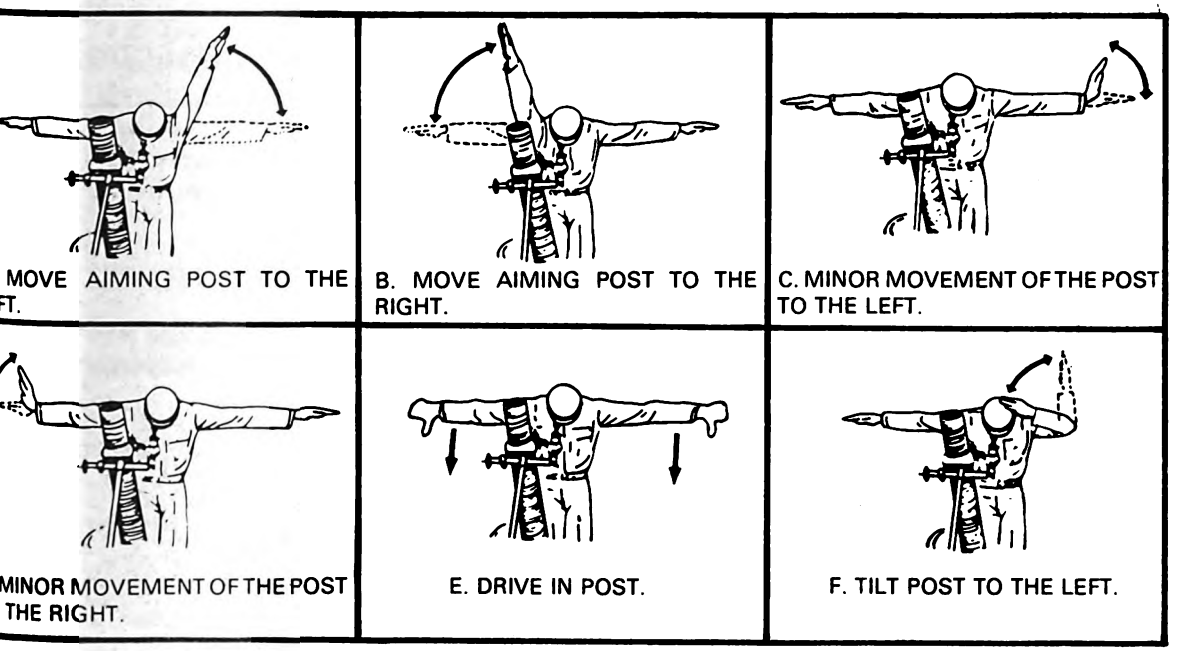
MOVE AIMING POST TO THE FT.
B. MOVE AIMING POST TO THE RIGHT.
C. MINOR MOVEMENT OF THE POST TO THE LEFT.
MINOR MOVEMENT OF THE POST THE RIGHT.
E. DRIVE IN POST.
F. TILT POST TO THE LEFT.

Figure 3.

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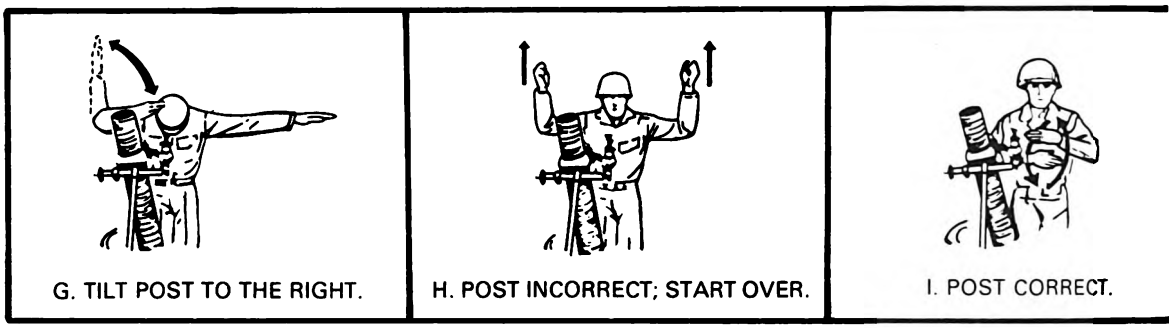

Figure 3. (CONT).

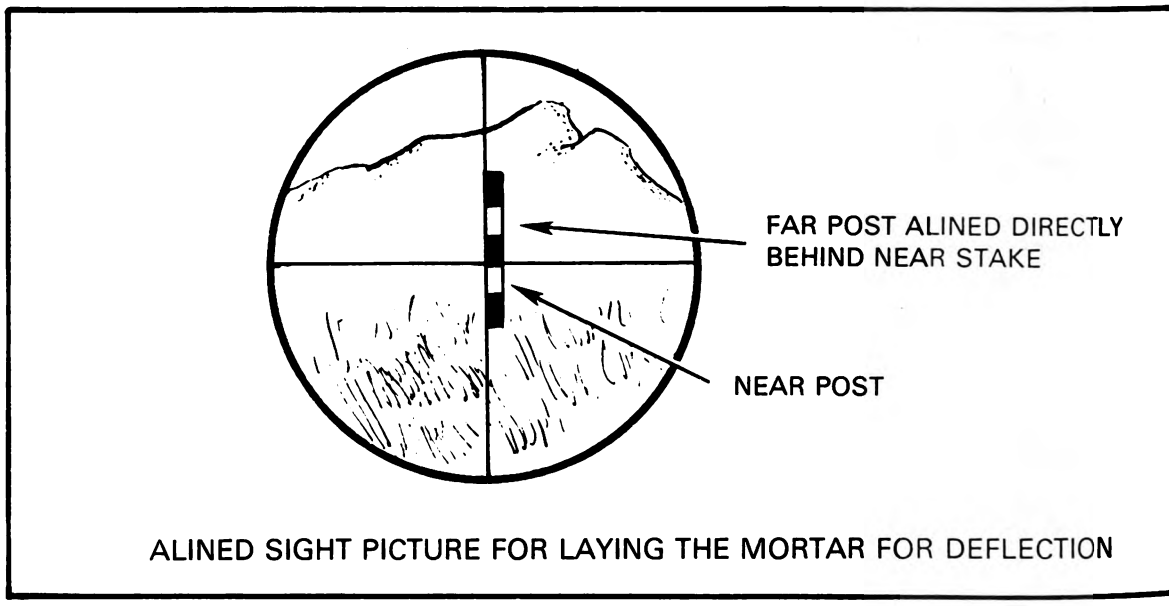

Figure 4.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 65, para 83; page 91)
TEC Lesson 010-071-6636, Prepare to Fire; Reciprocally Laying with M2 Aiming Circle

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TASK NUMBER: 071-321-3911

MANIPULATE MORTAR FOR TRAVERSING AND SEARCHING FIRES

CONDITIONS:

Given a mounted 81-mm mortar laid on aiming posts with 2800 mils deflection and 1100 mils elevation, assistant gunner, and firing data in the form of an initial fire command for one traversing mission and one searching mission (number of rounds specified must be four). Gunner will prepare gun to traverse left or right but will not re-lay on aiming posts until fire command is given.

STANDARDS:

1. Traversing Mission: Within 80 seconds, the gunner will insure sight is correctly set for elevation, command "FIRE" for each round, and cross-level and traverse between rounds (number of turns to be given in initial fire command). Mortar will be cross-leveled after last round is fired and will be within 20 mils of aiming posts when traversed back number of turns given in fire command.

2. Searching Mission: Within 60 seconds, the gunner will insure sight is correctly set for deflection, command "FIRE" for each round, and cross-level and search (number of turns to be given in initial fire command). After the last round is fired, the mortar will be searched down (up) the number of turns given in the fire command, cross-leveled and will be within 20 mils for elevation.

PERFORMANCE MEASURES:

1. Traversing Mission: Within 80 seconds, the gunner will insure sight is correctly set for elevation, command "FIRE" for each round, and cross-level

a. Mortar is mounted with deflection 2800 mils and elevation 1100 mils on sight and laid on aiming posts with traversing bearing centered.

b. Gunner is given command "PREPARE TO TRAVERSE RIGHT (LEFT)."

c. Gunner traverses mortar in opposite direction, left (right) until traversing bearing is stopped by yoke assembly, then backs off two turns. He does not re-lay on the aiming posts until fire command is given.

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d. When gunner is ready, he is given a fire command (example: "FOUR ROUNDS, TRAVERSE RIGHT THREE TURNS, CHARGE TWO, ELEVATION ONE, ONE, SEVEN, FIVE"). Gunner repeats each element of fire command.

e. Gunner sets data on sight, lays mortar on aiming posts, and commands "FIRE ONE." Traverses number of turns specified, cross-levels and commands "FIRE TWO." Gunner repeats process until all rounds are fired.

NOTE: To check for proper lay or error, traverse mortar back total number of turns and cross-level; the vertical crossline of the sight should be no more than 20 mils off the left edge of aiming posts.

2. **Searching Mission.**

a. Mortar is mounted with deflection 2800 mils and elevation 1100 mils on sight and laid on aiming posts.

b. Gunner is given fire command for searching mission (example: "FOUR ROUNDS, SEARCH UP (DOWN) THREE TURNS, CHARGE TWO, ELEVATION ONE ONE SEVEN FIVE").

c. Gunner places data on sight, levels gun, lays on aiming post, and commands "FIRE ONE." Searches number of specified turns, levels, and commands "FIRE TWO." Gunner repeats process until all rounds are fired.

NOTE: To check for proper lay or error, search down (up) total number of turns given, and rotate elevation micrometer knob until bubble is level. Elevation should be within 20 mils of elevation given in fire command.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 55, para 63; page 92)

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TASK NUMBER: 071-321-3912

PLACE A CARRIER-MOUNTED 81-MM MORTAR INTO ACTION

CONDITIONS:

Acting as the gunner, given an M125 A1 mortar carrier, 81-mm mortar complete in the travel position with tiedown strap in place, sight and sight extension, direction stake in place 25 meters to rear of carrier, assistant gunner, and driver. The gunner, assistant gunner, and driver will be in the carrier in their normal firing positions. The roof hatches will be closed. (The ramp may be down for this task to facilitate grading.)

STANDARDS:

Place the mortar into action within 90 seconds IAW the performance measures below.

PERFORMANCE MEASURES:

1. **On the command "TO YOUR FRONT, ACTION" the following actions will take place:**

a. The gunner and assistant gunner will reach up and unlatch the hatch covers, open and latch them back. (Driver will insure hatch covers are latched open.)

b. The gunner will disengage the ratchet on tiedown strap and loosen the strap to allow the assistant gunner to unhook his end, then remove and stow tiedown strap (figure 1).

c. Gunner and assistant gunner will grasp the bipod, raise the bipod and cannon, and install the bipod in the center slots of the bipod support (figure 2). The assistant gunner will then lock the bipod locking lever (figure 3).

d. The gunner will place the sight extension in the dove-tail slot of the bipod and then set the correct deflection and elevation on the sight and attach the sight to the sight extension.

e. While the gunner is working with the sight, the assistant gunner will unlock the turntable locking lever (figure 4).

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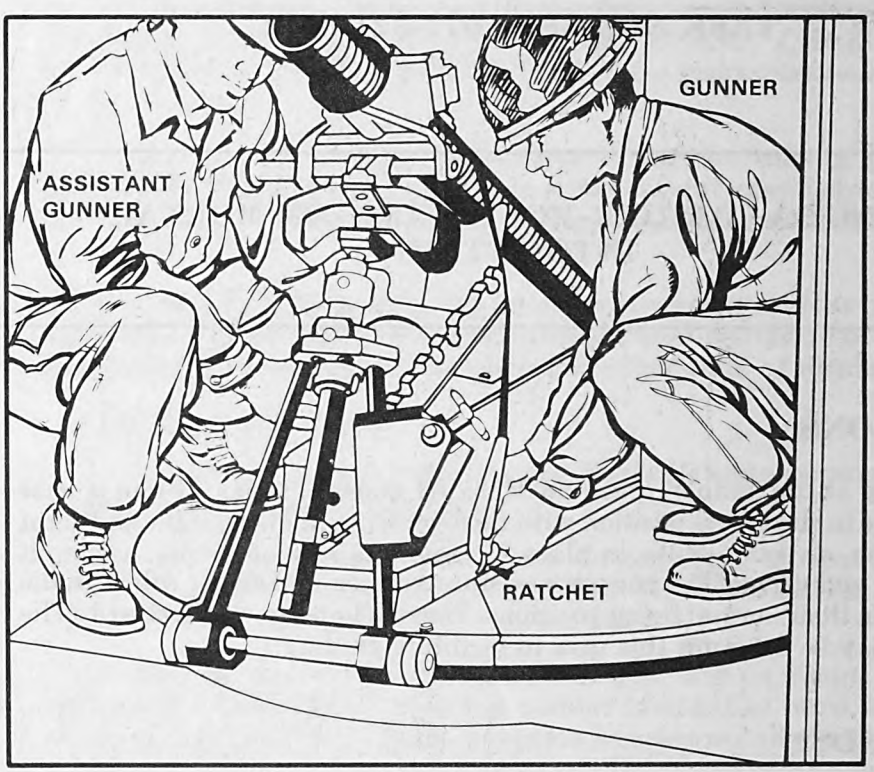

Figure 1.

Figure 2.

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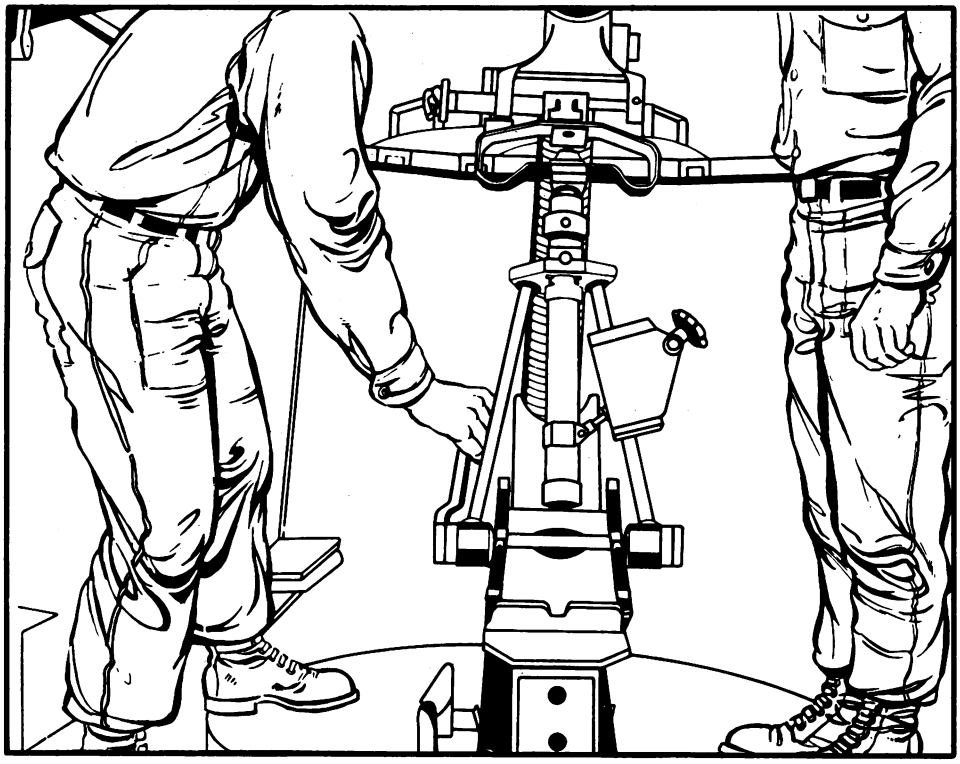

Figure 3.

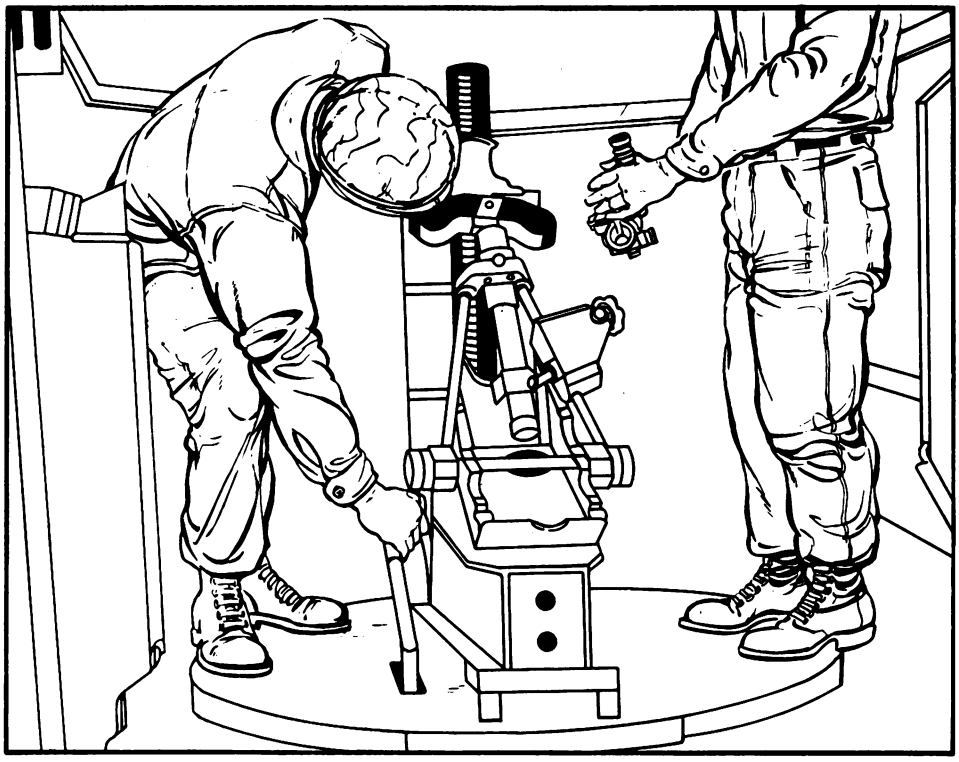

Figure 4.

2-VIII-B-1.3

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f. The gunner, after looking through the sight, will determine if the turntable needs shifting. If it needs shifting, he will tell the assistant gunner which direction and how much to shift the turntable. When the shift is complete, the assistant gunner will insure the turntable locking lever is relocked.

g. The gunner will make the required minor adjustments on the mortar to obtain a correct alined sight picture with both bubbles level.

h. When the gunner is satisfied with the lay of the mortar, he will announce "UP" and step away from the mortar.

NOTE: Time is counted from the command "TO YOUR FRONT, ACTION" till the gunner's "UP".

2. **After the gunner has completed the task, the mortar will be checked for the following:**

a. The correct data is on the sight.

(1) M53, Deflection 3200, Elevation 1100.

(2) M34A2, Deflection 0, Elevation 1100.

b. Elevation and crosslevel bubbles are level (within outer red lines).

c. Vertical cross line is within 2 mils of the left edge of the direction stake.

d. Traversing bearing is within two turns of center.

e. Bipod assembly is in center slot of bipod support and locking lever is locked.

f. Turntable locking handle is in locked position.

g. Time did not exceed 90 seconds.

3. **When firing in any direction other than to the rear (over the ramp), the following actions will take place:**

a. Squad leader (track commander): Lock caliber .50 machinegun in travel position, traverse commander's cupola to aline inside marks; lock cupola and close and latch cupola.

b. Driver: tie down antenna.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 3, page 76, para 94)
TEC Lesson 010-071-6642-F, The Carrier-Mounted 81-mm Mortar

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TASK NUMBER 071-321-3917

REMOVE A MISFIRE FROM THE 81-MM MORTAR (CARRIER-MOUNTED)

CONDITIONS:

Acting as the gunner, given a carrier-mounted 81-mm mortar prepared for firing, one training cartridge M68 or a wooden dummy round, an assistant gunner, an ammo bearer, and an ammo bearer/driver.

STANDARDS:

Perform misfire procedures within 7 minutes, IAW performance measures below.

PERFORMANCE MEASURES:

1. During firing, the first crew member who notes a misfire has occurred announces in a loud voice, **"MISFIRE."**

2. Prior to the removal of the misfire from the cannon (barrel), certain actions will take place.

a. At the announcement of **MISFIRE,** all crew members except the gunner will leave the carrier and move to the rear of the mortar position a safe distance (50 meters).

b. When the crew has left the carrier, the gunner moves to the rear of the mortar and kicks the cannon several times to dislodge the round if it should be hanging in the cannon somewhere between the muzzle and the firing pin (figure 1).

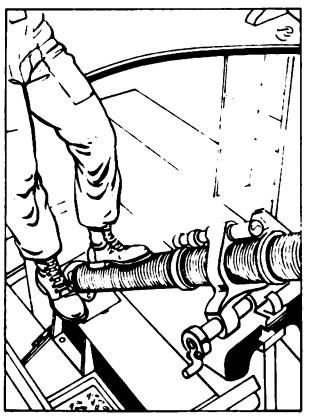

Figure 1.

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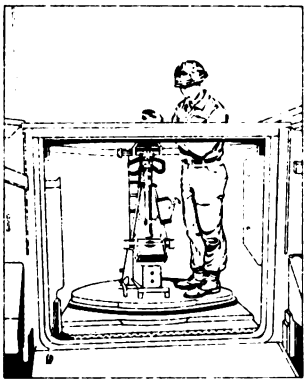

Figure 2.

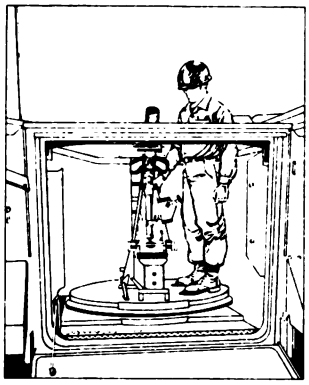

Figure 3.

Figure 4.

c. If the round does not fire after the cannon is kicked, the gunner will leave the carrier and join the rest of the crew. The gunner will then wait 1 minute. (This 1-minute wait is to allow the round to fire should there be a delayed action of the propelling charge.)

d. After the 1-minute wait, the gunner returns to the carrier and performs the following:

(1) Checks the cannon for heat. Barehanded, using the fingertips, and starting at the muzzle, he lightly touches the cannon. If the cannon is cool to warm, he then continues down the cannon to the base (figure 2).

(2) If he determines the cannon is cool enough to handle, he calls the assistant gunner forward.

NOTE: If the ramp is up during firing and a misfire occurs, the driver also remounts the carrier and lowers the ramp.

(3) While the assistant gunner is coming forward, the gunner will remove the sight and sight extension and lay it out of the way. He then depresses the cannon to its lowest elevation, then elevates the mortar 30 full turns of the elevating crank (figure 3). This will allow the cannon to clear the crossbeam at the rear of the carrier when the cannon is lifted to remove the round (figure 4).

(4) The gunner and assistant gunner will then move the turntable until the mortar is approximately centered on the ramp opening (figure 5). (The assistant gunner will relock the turntable locking handle.)

3. In removing the misfired round from the cannon, the following actions will take place.

a. The assistant gunner will move to the right of the mortar. He will then place his hands on the cannon near the muzzle, left hand on top, the right hand under the cannon (figure 6).

b. The gunner, standing to the left of the mortar, will reach down and unlock the cannon from the mortar crossbeam by giving it a ¼ turn (figure 7).

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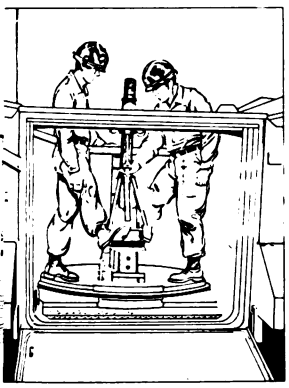

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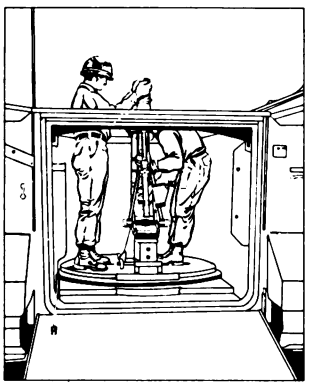

Figure 6.

Figure 7.

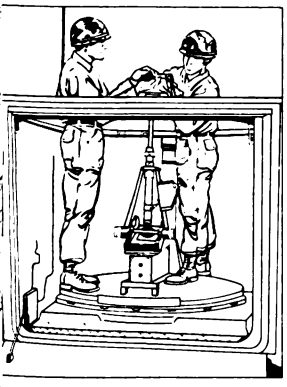

Figure 8.

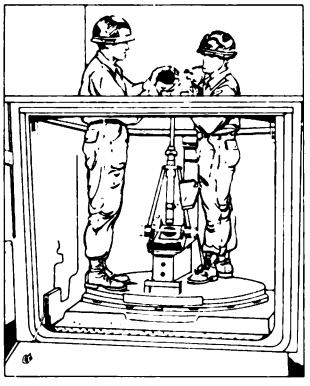

Figure 9.

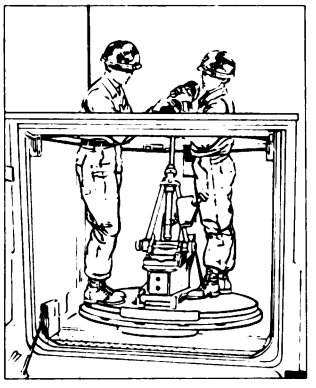

Figure 10.

c. When the gunner is sure the assistant gunner is ready, he will slowly and smoothly raise the cannon to a horizontal position (figure 8).

d. At this point the assistant gunner will slip his thumbs slightly over the edge of the muzzle to stop the round as it slides out (figure 9).

e. The gunner will now continue to raise the cannon until the round slides out and is caught by the assistant gunner (figure 10).

f. The round is then passed to the ammo bearer who has joined the gunner and assistant gunner at the carrier.

g. After receiving the round, the ammo bearer will attempt to replace the safety pins.

(1) If the safety pins can be replaced the round is then inspected to determine the cause of the misfire. If the ignition cartridge has not struck the firing pin and no other cause can be found, the crew, after re-laying the mortar, will attempt to refire the round.

(2) If the safety pins cannot be replaced in the fuze, the round will be placed in the DUD PIT and disposed of according to unit SOP.

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h. While the ammo bearer is inspecting the round, the gunner and assistant gunner will place the mortar back into action by doing the following:

(1) The gunner will raise the cannon as high as possible and shake it to remove any trash or foreign objects from the bore.

(2) He lowers the cannon and locks it to the mortar crossbeam.

(3) He replaces the sight and sight extension and re-lays the mortar.

(4) The assistant gunner will then swab the bore.

i. The mortar crew is now ready to continue the mission.

NOTE: If the round is lodged and will not slide out when the cannon is raised, remove the cannon from the bipod, keeping the muzzle down range, place the cannon in the DUD PIT and follow unit SOP for this situation.

4. Listed below is a short summary of what each crew member must do.

GUNNER	ASSISTANT GUNNER	AMMO BEARER
1. Tests barrel for heat and calls assistant gunner forward.		
2. Traverses turntable until mortar is centered on the rear of the ramp opening.	2. Assists gunner, re-engages locking handle.	
3. Depresses mortar to its lowest elevation then elevates mortar 30 turns.		
4. Removes sight and sight extension and places it out of the way.		
5. Unlocks barrel from mortar socket.	5. Places hands near muzzle; right hand palm up, left hand palm down.	
6. Lifts barrel to horizontal and pulls back on bipod assembly.	6. Places thumbs over muzzle.	
7. Continue to raise barrel until round starts to move.	7. Stops round, removes it, and hands it to ammo bearer.	7. Attempts to replace safety pins and determine cause of misfire.
8. Shakes barrel to dislodge remnants of last round.		
9. Locks barrel to baseplate.	9. Swabs bore.	
10. Replaces sight and relays on last data given.		

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 77, para 95)

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TASK NUMBER: 071-322-4201

GROUND MOUNT 107-MM (4.2-IN) MORTAR

CONDITIONS:

You are the gunner on a 107-mm mortar. Given: A 107-mm mortar complete with sight (either M53 or M34A2), directional stake, baseplate stake, and three soldiers to act as assistant gunner, first ammunition handler, and second ammunition handler. Each member of the mortar crew will perform this task acting as the gunner.

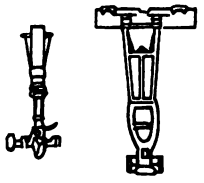
STANDARDS:

The mortar will be mounted within 100 seconds IAW the performance measures below.

PERFORMANCE MEASURES:

To ground mount the 107-mm mortar:

1. Baseplate stake and mortar parts will be laid out with the baseplate 1 meter from the baseplate stake and a directional stake 25 meters from the baseplate stake (figure 1).



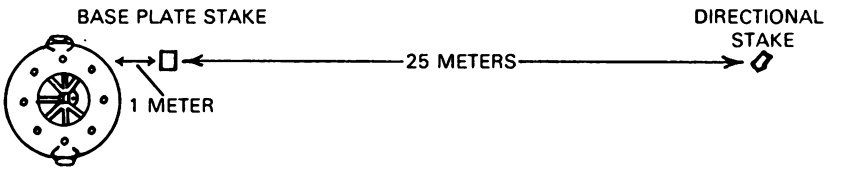


Figure 1.

2. The sight, in its locked case, will be placed 2 feet to the left and 2 feet in front of the baseplate stake (the gunner has the option of placing the sight case anywhere he wants it in relation to the baseplate stake) (figure 2).

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Figure 2.

3. At the command "MAKE A PREMOUNT CHECK," the crew members will make the following checks.

a. Gunner: The gunner will make the following checks on the baseplate and rotator.

(1) Rotator moves freely with no binding.

(2) Rotator is fully seated.

(3) Open side of rotator faces direction of fire.

(4) Bridge socket is free of debris.

(5) Baseplate is not warped or broken.

b. Assistant Gunner: The assistant gunner makes the following checks on the STANDARD.

(1) Elevation mechanism is in low range.

(2) Elevation mechanism is at lowest elevation.

(3) Traversing wheel handle is closed.

(4) Traversing mechanism works smoothly.

(5) Elevation mechanism works smoothly.

(6) Traversing mechanism is traversed all the way to the right.

c. First Ammunition Handler: The first ammo handler will make the following checks on the BRIDGE.

(1) Handles are not broken or missing.

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(2) Barrel socket is free of debris.

(3) Standard trunnion socket is free of debris.

d. Second Ammunition Handler: The second ammo handler will make the following checks on the BARREL.

(1) Sight leveling knob works freely.

(2) Locking pin works freely.

(3) Locking pin is fully seated and locked.

e. As each member of the crew checks his piece of equipment, he will notify the gunner that it is "OK," or what is wrong with it. When the gunner is satisfied that all is ready, he will announce to the squad leader "ALL CORRECT." The crew is now ready to mount the mortar.

4. Perform the following actions upon the squad leader's command "TO YOUR FRONT, ACTION."

a. At the command, "ACTION," the following will take place.

(1) The gunner on the left side and the assistant gunner on the right lift and move the baseplate and rotator (carried as one unit) to the baseplate stake and correctly position it in relation to baseplate stake (figure 3).

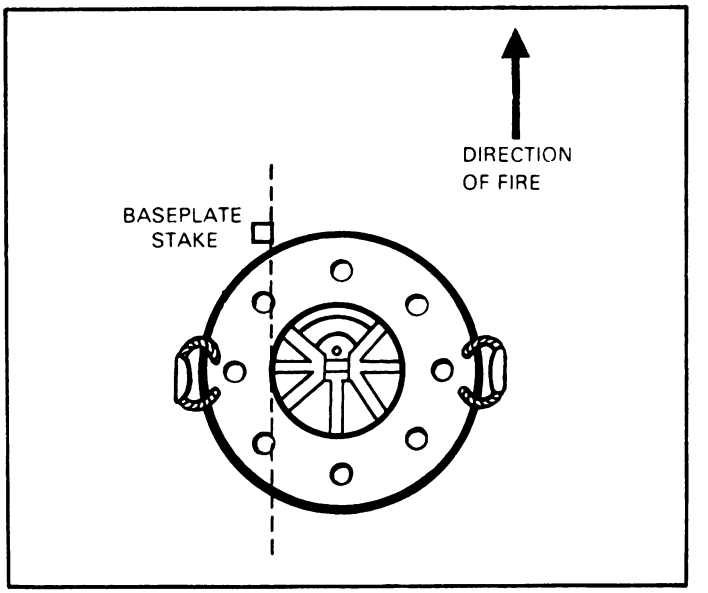

Figure 3.

(2) The gunner will then move to the sight box, remove the sight, and place the correct data on it.

M53 Sight	M34A2 Sight
A. Deflection 3200	A. Deflection 0
B. Elevation 0900	B. Elevation 0900

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(3) The assistant gunner will move to and bring up the STANDARD.

(4) As soon as the BASEPLATE is in position, the first and second ammo handlers will bring the BRIDGE forward. The first ammo handler will set the trunnions of the bridge on the trunnion socket of the ROTATOR. The second ammo handler lifts the spade end of the BRIDGE letting the trunnions slide into place on the ROTATOR (figure 4). The spade end of the bridge is then lowered and seated on sandbags or an ammo box (for live firing, the baseplate will be dug in and the spade of the bridge will rest on the ground). They will then return to bring the barrel forward.

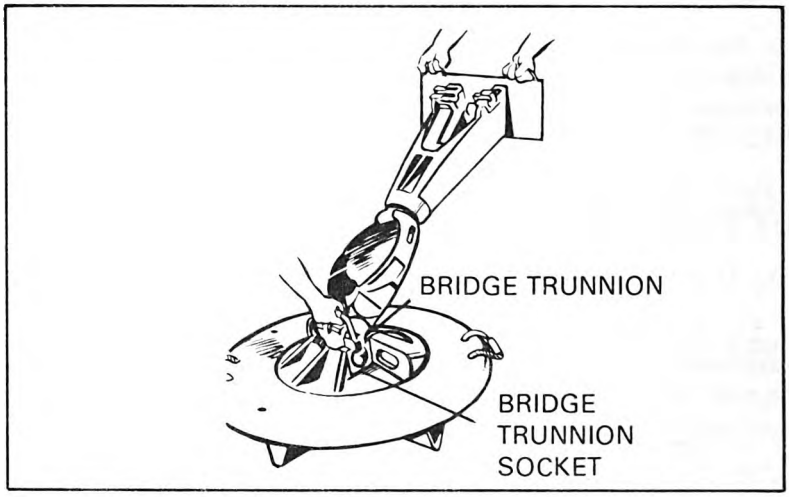

Figure 4.

(5) As soon as the bridge is in position, the assistant gunner will install the standard. To do this, he places the standard on the bridge behind the standard base trunnion socket, tilts the top of the standard forward and pulls the standard toward himself. This will allow the standard base trunnions to fall into the trunnion sockets (figure 5). The assistant gunner will then raise the standard to the vertical, center the traversing assembly slide, and elevate the elevating mechanism 15 turns.

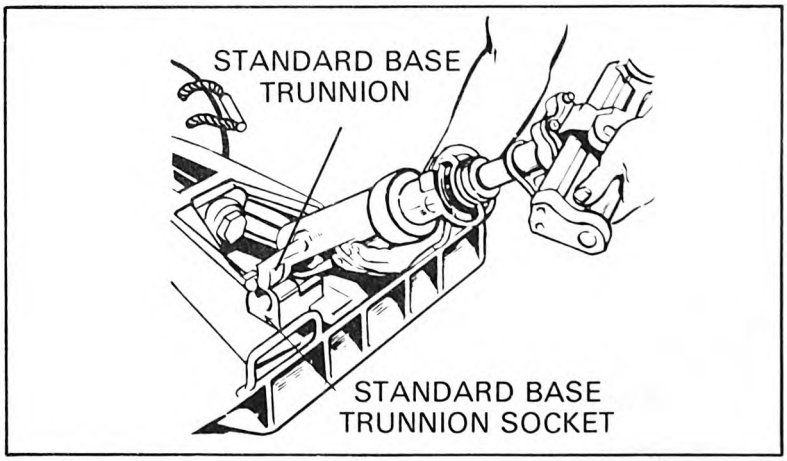

Figure 5.

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NOTE: Since it is possible to place the standard in backward, insure the standard base trunnions bisect the barrel (figure 6).

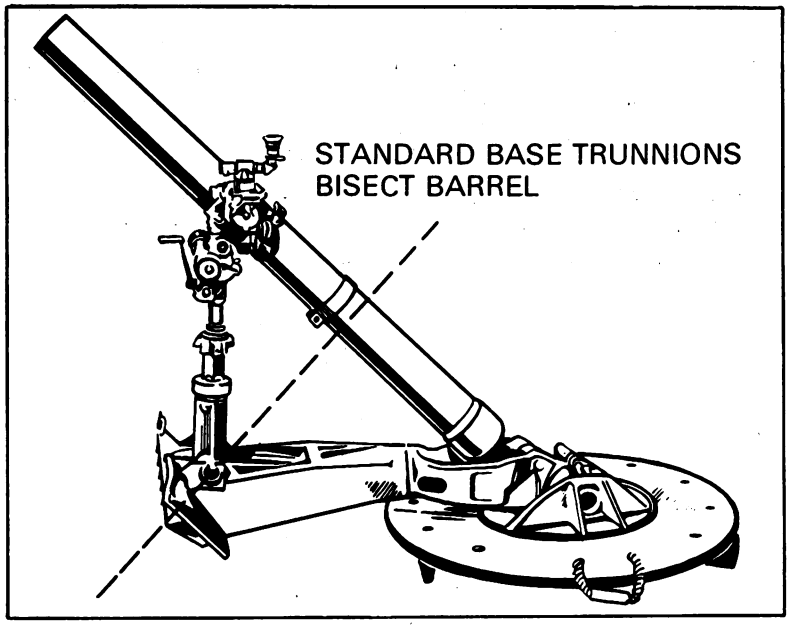

Figure 6.

(6) While the standard is being installed, the barrel is brought forward by the ammo handlers, with the first ammo handler carrying the base end. The barrel is brought to the left side of the baseplate, and the base of the barrel is set on the bridge above the barrel socket. The second ammo handler moves the barrel slightly to the left, which allows the left tube cap trunnion to slide into its recess, then back to the right, allowing the right tube cap trunnion to slide down into its socket (figure 7). The second ammo handler then places the barrel on the right shoulder of the assistant gunner.

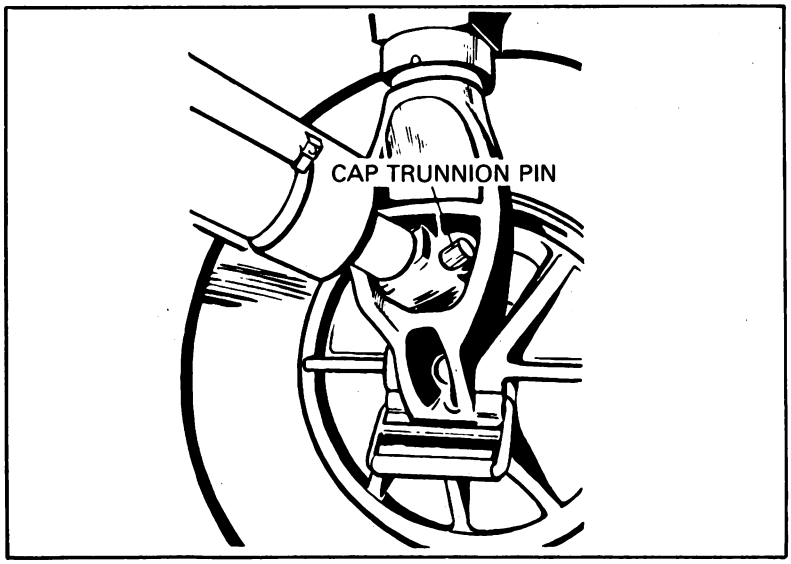

Figure 7.

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(7) The second ammo handler then unlocks and withdraws the mortar locking pin. The assistant gunner then lowers the barrel and engages the locking lug of the slide assembly, inserts the mortar locking pin, and turns it one-half turn to lock the barrel to the standard (figure 8).

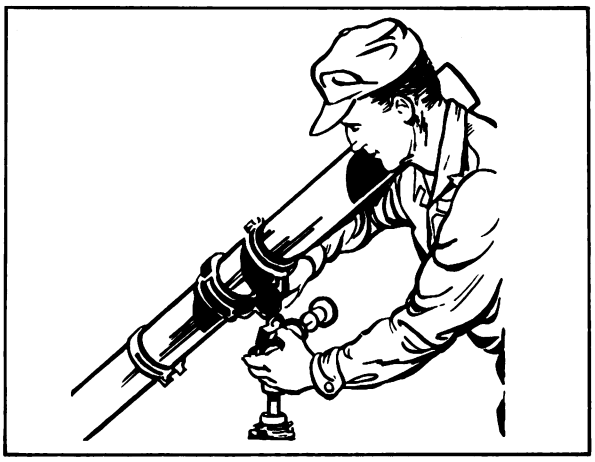

Figure 8.

(8) The gunner, having indexed the data on the sight, now places the sight on the mortar, and with the help of the assistant gunner, shifts the mortar (if needed) and lays on the directional stake with the correct sight picture and all bubbles level.

(9) After making a final check of the sight picture and bubbles, the gunner steps away from the mortar and announces "UP."

(10) The mortar is now mounted.

b. The squad leader checks the mortar for the following:

(1) Sight is set correctly for deflection and elevation 900 mils.

(2) Crosslevel and elevation bubbles are centered.

(3) Mortar locking pin is fully locked.

(4) Connection for the mortar locking pin assembly is not off center more than 2 turns.

(5) Vertical crossline of sight is no more than 2 mils off left edge of the directional stake.

(6) Baseplate is positioned correctly in relation to baseplate stake.

NOTE: In the past, FM 23-92, 4.2-Inch Mortar, M30, did not require the mortar to be laid on a directional stake. This is a change in procedure which will be in the next change to the manual.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, 10 Jun 70 (chap 2, page 61, para 63, and chap 4, page 97, para 116).

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TASK NUMBER: 071-322-4202

BORESIGHT 107-MM (4.2-IN) MORTAR

CONDITIONS:

Given a mounted 107-mm (4.2-in) mortar complete with M53 or M34A2 sight, M45 boresight, screwdrivers, direction stake, and an assistant gunner.

STANDARDS:

Boresight the 107-mm (4.2-in) mortar within 5 minutes using either of the methods listed below:

1. Distant aiming point: Both the sight unit and the boresight must be alined on the same aiming point (at least 200 meters from mortar) and all bubbles level. The sight will have a deflection of 3200 mils +, - 1 mil (the M34A2 sight deflection is 0 mils) and an elevation of 0800 mils +, - 1 mil. When checking for proper alinement, gunner will use half of the mil variation between the sight and boresight. Mortar will not be more than two turns from center traverse.

2. Sight box: The sight box will be approximately 25 meters from the mortar, with vertical crossline of sight alined on left edge of sight box, and boresight vertical crossline alined on the right edge of sight box, and all bubbles level. The M53 sight will have a deflection of 3200 mils (0 mils for M34A2 sight) +, - 1 mil and an elevation of 0800 mils. When checking for proper alinement, gunner will use half of the mil variation between the sight and boresight. Mortar will not be more than two turns from center traverse.

PERFORMANCE MEASURES:

To boresight 107-mm (4.2-in) mortar using M45 boresight (FM 23-92, page 32, para 34).

1. On mounted mortar, place a deflection of 3200 mils on M53 sight (0 on M34A2) and 0800 mils elevation and level bubbles.

2. Place M45 boresight on mortar and level bubbles (figure 1).

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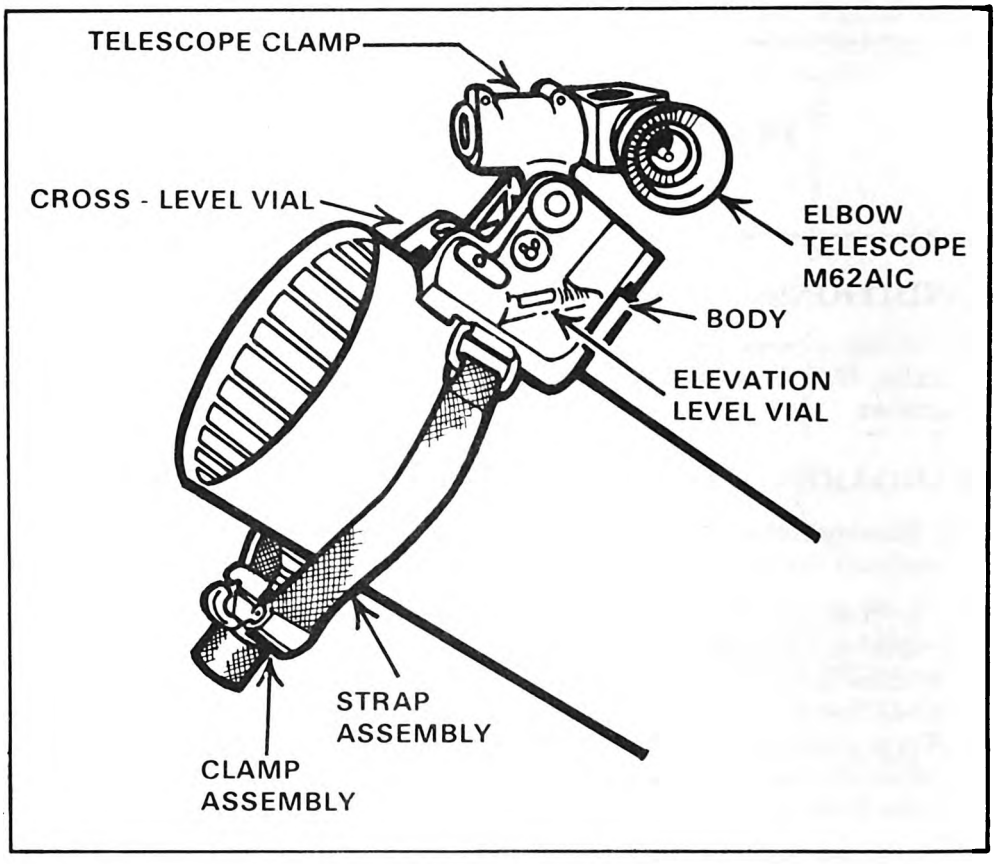

Figure 1.

3. Elevation setting: Check elevation bubble on sight; if not level:

a. Turn elevation knob on sight and level bubble.

b. Loosen elevation scale, slip scale until it reads 0800 and secure.

c. Loosen elevation micrometer scale, slip scale until it reads 0, and secure.

4. Deflection setting: Check to insure the sight setting reads 3200 on fixed deflection (red) scale (0 M34A2) then:

a. Distant aiming point method:

(1) Pick an aiming point no less than 200 meters from mortar.

(2) Aline vertical crossline of boresight on aiming point, insuring bubble on boresight is level.

(3) Aline vertical crossline of sight on same edge of aiming point.

(4) If reading is not 0, loosen micrometer knob, slip scale to reading of 0, and secure.

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b. M53 Sight Box Method. (References, None.)

(1) Place sight case so that the case is perpendicular to the mortar, 25 meters from the mortar (assistant gunner).

(2) Aline vertical crossline of boresight on right side of sight case.

(3) Using the micrometer knob, aline vertical crossline of sight on left side of sight case.

(4) If reading is not 0 on micrometer scale, loosen screws on base of micrometer knob, slip scale to reading of 0, and secure.

c. To insure proper alinement.

(1) Place boresight underneath cannon (figure 2).

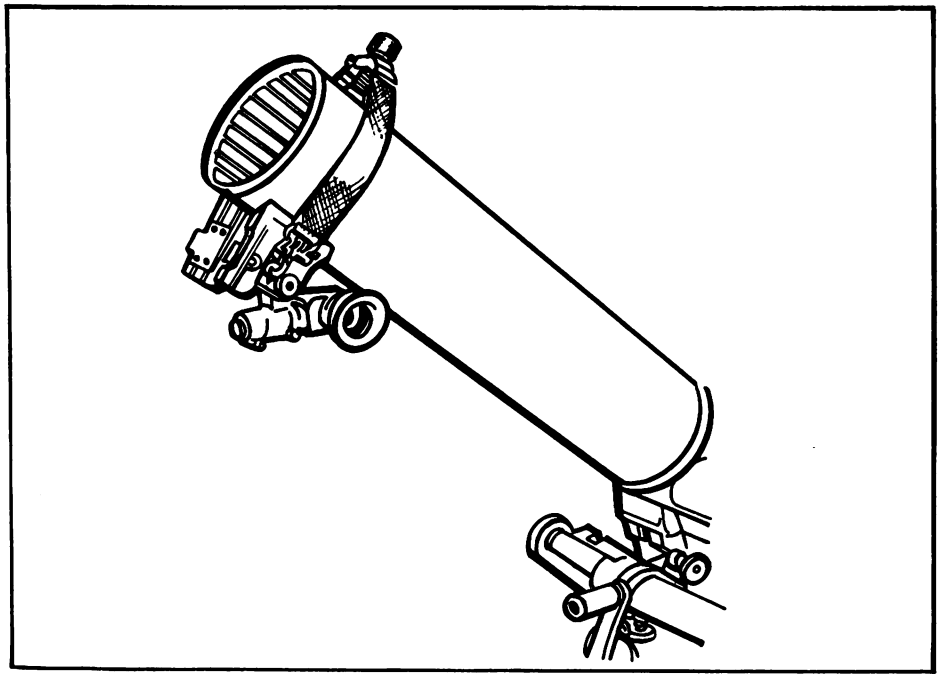

Figure 2.

(2) Level bubbles and check vertical crossline to see if it is on aiming point.

(3) If vertical crossline is not on aiming point, rotate micrometer knob and place vertical line back on aiming point.

(4) Determine mil variation and index half of the mil variation between the sight and boresight; slip the zero on micrometer scale to the index mark.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, 10 Jun 70 (chap 1, page 32, para 34)

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TASK NUMBER: 071-322-4203

PERFORM SAFETY CHECKS ON 107-MM (4.2-IN) MORTAR (GROUND- AND CARRIER-MOUNTED)

CONDITIONS:

You are the gunner or acting gunner on a 107-mm mortar. Given a mounted 107-mm mortar complete with sight and an assistant gunner.

STANDARDS:

Within 5 minutes, make the safety checks IAW the performance measures below.

PERFORMANCE MEASURES:

1. Check for MASK and OVERHEAD clearance as follows (both ground- and carrier-mounted):

a. Mask clearance - Lower barrel to 800 mils elevation, and with eye placed near the tube cap, sight up along the barrel to see if there is any obstruction in the path of the round.

b. Overhead clearance - Raise the barrel to 1065 mils elevation, and with eye placed near the tube cap, sight up along the barrel to see if there is any obstruction overhanging the mortar.

NOTE: If there is any point to the front of the mortar where an elevation of 800 cannot be fired or any point where an elevation of 1065 cannot be fired, notify the squad leader.

2. Check the ground-mounted mortar (FM 23-92, page 57, para 56) to insure:

a. Tube cap trunnion pins are properly inserted into the bridge socket.

b. Bridge trunnions are properly inserted into the bridge trunnion socket of the rotator assembly.

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c. There is clearance between the bridge assembly and the rotator pad; that the bridge spade has contact with the ground (sandbags should not be used to support the bridge spade during firing); and that any noticeable cant has been removed from the weapon.

d. Standard base trunnions are properly seated in the standard base trunnion bearings of the bridge.

e. Elevating assembly cam is in the locked position.

f. Standard assembly is properly coupled and locked to the cannon by the mortar locking pin assembly (turned 180° in either direction).

3. Check the carrier-mounted mortar (FM 23-92, page 87, para 90) to insure:

a. The trunnion detent pins are in the innermost detent.

b. The traversing lock handle is locked.

c. The standard support assembly is in a raised position and firmly latched.

d. The standard base trunnions are correctly alined and seated in the standard support trunnion bearing.

e. The elevating mechanism cam is locked and operational.

f. The recoil stop is in position and the wingnut is tight.

g. The mortar locking pin is fully seated and locked.

h. The two mortar hatch covers are securely latched.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 2, page 57, para 56; chap 3, page 87, para 90)

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TASK NUMBER: 071-322-4204

LAY MORTAR FOR DEFLECTION AND ELEVATION (D&E) (GROUND/CARRIER-MOUNTED)

CONDITIONS:

Given:

1. A mounted 107-mm (4.2-in) mortar; sight set on 2800 deflection, 0900 elevation, with bubbles level; aiming posts placed out on referred deflection of 2800 mils; and an assistant gunner.

2. A small deflection change (more than 50 mils but less than 75 mils for deflection).

3. A large D&E change (more than 200 mils) but less than 300 mils for deflection and a change from high range to low range, or vice versa, for elevation).

STANDARDS:

1. Small deflection changes: Within 20 seconds, mortar must be correctly laid for deflection and elevation, both bubbles on sight must be level, and vertical crossline of the sight within 2 mils of the left edge of the aiming post.

2. Large D&E changes: Within 55 seconds, mortar must be correctly laid for deflection and elevation so that the D&E is the same as given in the initial fire command, both bubbles on sight are level, vertical crossline of the sight is no more than 2 mils off the compensated sight picture, and the traversing mechanism is no more than two turns to the left or right of the center position.

PERFORMANCE MEASURES:

1. For small deflection changes (ground/carrier-mounted):

a. On a mounted mortar, sight is laid on aiming posts with a referred deflection of 2800 mils and 0900 mils elevation.

b. Gunner is given a deflection change in the form of initial fire command.

c. As soon as data is announced, the gunner places it on the sight, and then traverses onto aiming posts (assistant gunner crosslevels).

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d. When gunner is satisfied with his sight picture (figure 1), he announces "UP."

ALINED SIGHT PICTURE FOR LAYING THE MORTAR FOR DIRECTION

Figure 1.

e. Squad leader checks gun.

2. For large D&E changes (ground-mounted mortar):

a. On a mounted mortar, sight is laid on aiming posts with a referred deflection of 2800 mils and 0900 mils elevation.

b. Gunner is given a D&E change in the form of an initial fire command.

c. As soon as data is announced, the gunner places it on the sight.

d. Assistant gunner picks up spade end of bridge.

e. Gunner moves mortar and alines sight approximately on aiming posts.

f. Assistant gunner, after word from the gunner, firmly seats bridge on ground.

g. Gunner levels mortar and takes up proper sight picture (figure 2).

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h. Squad leader checks gun.

3. For large D&E changes (carrier-mounted mortar):

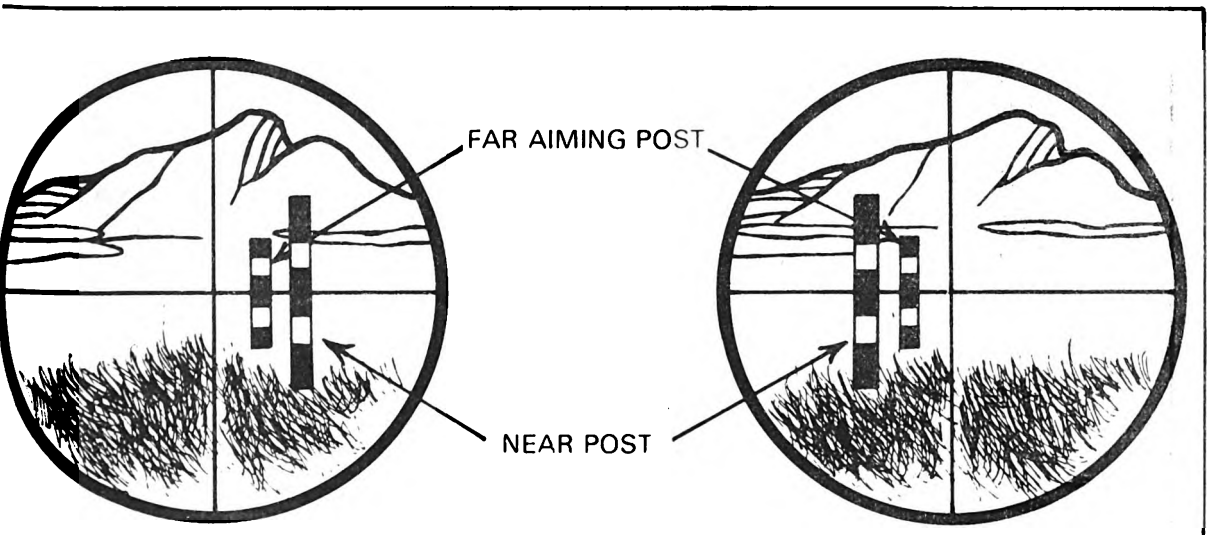
a. On a mounted mortar, sight is laid on aiming posts with a referred deflection of 2800 mils and 0900 mils elevation.

b. Gunner is given a D&E change in the form of an initial fire command.

c. As soon as data is announced, the gunner places it on the sight.

d. Assistant gunner unlatches traverse locking handle, gunner and assistant gunner rotate turntable and aline sight approximately on aiming posts, assistant gunner locks turntable.

e. Gunner levels mortar and takes up proper sight picture (figure 2).



COMPENSATED SIGHT PICTURE WHEN THE SIGHT IS DISPLACED TO THE LEFT OR RIGHT OF THE AIMING POSTS.

Figure 2.

f. Squad leader checks gun.

NOTE: All elements of the fire command are repeated by the gunner.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 2, page 62-63, para 64-65; chap 3, page 83, para 85; chap 4, page 100, para 117 and page 107, para 119)

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TASK NUMBER: 071-322-4205

PREPARE 107-MM (4.2-IN) MORTAR AMMUNITION FOR FIRING

CONDITIONS:

Given: M14, M26, M27, or M63 fuze setter, M18 fuze wrench, and the following types of rounds and fuzes:

TYPE ROUND	TYPE FUZE
M329A1 (HE)	PD, M557; MTSQ, M564; PROX, M513
M328A1 Smoke/WP	PD, M521
M335A2 Illum	MT, M565

Type round, charge, fuze, and fuze settings will be given in the form of an initial fire command.

STANDARDS:

Within 1 minute after receipt of initial fire command, ammunition bearer will select round, set the fuze (when applicable) and charge as given in the initial fire command, IAW performance measures below.

PERFORMANCE MEASURES:

Preparing 107-mm (4.2-in) ammunition for firing:

1. Identification of rounds:

a. High explosive - OD w/yellow markings.

b. White phosphorus - light green w/red markings.

c. Illuminating ammunition - white w/black markings.

NOTE: Each round is stenciled with type model of round. (Example M328A1 - M335A2).

2. Setting charges:

a. The M36 propelling charge consists of one 4/8-increment, three 5-increment bundles, five single-increments, four 5-increment bundles, and one 4/8-increment on the round in this order for a total of 41 increments, or charges as they are called.

The M36A1 charge differs from the M36 in that the A1 has the M9 flake propellant bag replacing the first five M8 sheet propellant increments (five pack).

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The basic propellant is called a single charge and consists of two sheets sewn together, each sheet being 4/8 of a charge. Ten of these single sheets sewn together is called a "five pack" and is worth 5 charges. The M9 flake bag is a "five pack" also and must always be used as part of the charge on the round.

b. If less than charge 25 4/8 is to be used during a fire mission, the charge extension must be removed from the tail assembly of the round. The extension has a lefthand thread. To remove it, turn in a clockwise direction.

c. The FDC will determine the correct charge to be placed on the round. This will normally call for a whole and a fraction of a charge. The fraction will always be given in 8's of a charge, e.g., 1/2 will be given as 4/8, 1/4 will be given as 2/8.

EXAMPLE: If the FDC calls for a charge of 15 7/8 to be placed on the round, identify first which propellants are being used. If the M36A1 propellant is used, leave the powder bag, which is equal to a charge 5, then add two five packs. This will be a total of 15 charges. To add the 7/8-charge, select a single charge (two sheets sewn together) and remove 1/4 of 1 sheet (figure 1). Leave the sheets sewn together, place the remaining 7/8-charge between two of the five packs, to prevent its falling off during handling of the round. The round now has a charge of 15 7/8.

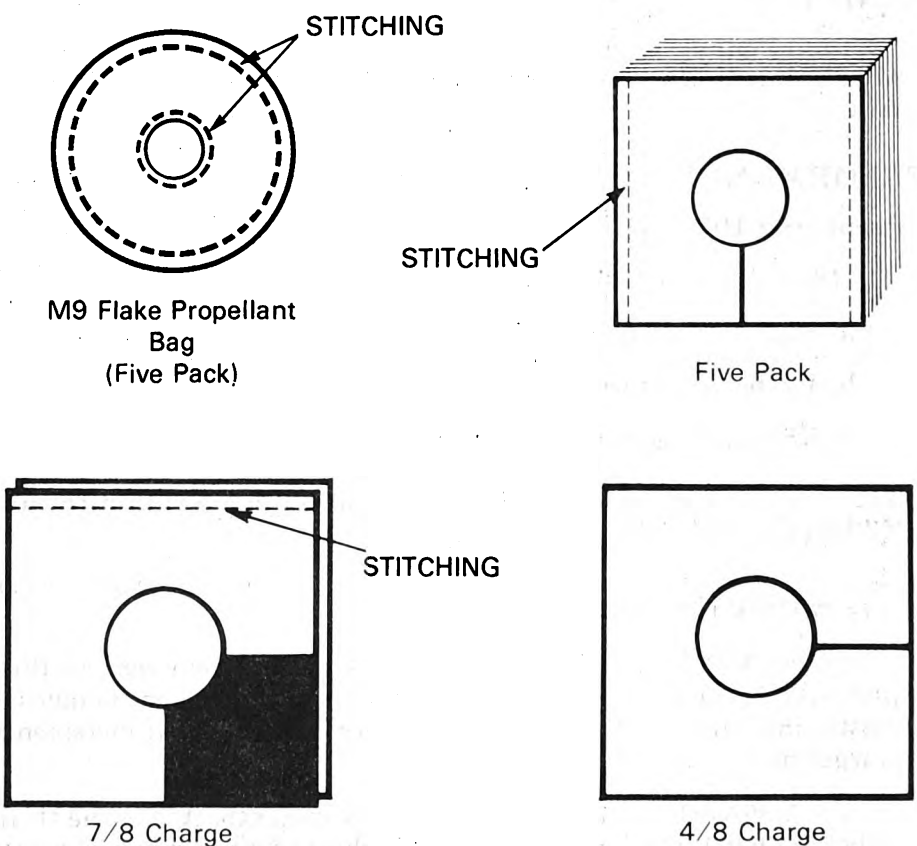

Figure 1.

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NOTE: Do not push wire propellant holder against the propellant, leave wire holder in groove to prevent possible misfire.

3. Preparing an unfuzed and a fuzed deep-cavity round:

a. To prepare an unfuzed or fuzed round for firing with mechanical time superquick (MTSQ) fuze -

(1) Inspect the cavity for damage and the presence of foreign material. Remove loose material from the cavity. If any high-explosive filler is found adhering to the threaded portion of the fuze cavity, place the round aside for disposal by qualified ammunition personnel.

(2) Examine the nose threads and the fuze to insure that they are in good condition. Do not use components with damaged threads.

(3) Screw the fuze into the fuze cavity and tighten it securely with an M18 or M7A1 fuze wrench. Make sure the fuze shoulder seats firmly against the nose of the shell. There should be no space between the fuze shoulder and the shell. Do not remove the supplementary charge.

(4) If not fired, restore the fuze and shell to their original condition and packing.

b. To prepare an unfuzed or a fuzed deep-cavity round for firing with the M513 proximity fuze -

(1) Using the tab lifting loop, remove the supplementary charge.

(2) Perform the steps outlined in (1) above.

(3) Screw in the proximity fuze by hand. If the fuze binds, inspect the fuze cavity and threads of both fuze and shell. Reject whichever is defective.

(4) Tighten the fuze with the M18 fuze wrench. Use only such force as can be applied by hand. If the fuze cannot be tightened to form a good seat between the shell and the fuze, reject the defective component. Do not hammer on the wrench or use an extension handle.

4. Preparing the fuze for firing.

a. Fuze, PD, M557. To set the fuze for delay action, turn the slot 90° to aline it with the index mark for DELAY. The setting may be changed (with the screwdriver end of the M18 fuze wrench or a similar tool) at any time before firing. This can be done in the dark by feeling the position of the slot and making the correct setting.

b. Fuze, MTSQ, M564. Remove the safety wire from the fuze. If only impact action is desired, set the fuze for 100 seconds. Fuzes are not to be fired when set on the shipping mark "S." If time action is required, set the fuze to the desired time, using the M14, M26, M27, or M63 fuze setter. The time can be set to the nearest ½ second.

NOTE: If, after setting the fuze, the round is not fired, reset the fuze to SAFE and replace the safety wire in its proper position before

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unfuzing the round and returning the components to their packing containers. Turn the fuze only in a clockwise direction.

(1) Use the cover of the fiber container to cover striker nut, cartridge extension, and propelling charge prior to fuzing the round. This cover protects against accidental ignition.

(2) Place the round on its side, with the closing plug or fuze pointing to the right.

(3) Remove the closing plug. If a round is fuzed, insert an M18 or M7A1 fuze wrench (insure that the proper slot is used) in the wrench slots of the fuze and strike the wrench handle (with the hand) sharply in a counterclockwise direction (while looking downward on the fuze), taking care not to strike any part of the fuze. Unscrew and remove the fuze.

c. Fuze, proximity, M513. Make time settings in the same manner as for a mechanical time fuze. Looking down on the nose of the fuze, rotate the M28 fuze setter in a clockwise direction. If point detonating action is desired, place a time setting of 90 seconds on the fuze.

d. Fuze, mechanical time, M562 and M565. These are the mechanical time fuzes used with the base-ejection M335A1 and M335A2 illuminating projectiles. Because of size and difference in threads, these fuzes cannot be interchanged with the MTSQ M564 fuze. These fuzes differ from the MTSQ M564 fuze in that they have a vernier scale which allows accurate settings to the nearest 0.1 second. Set time by turning the fuze only in a clockwise direction. For further information on these fuzes, see TM 9-1300-203.

NOTE: When making time settings using the time fuzes, it is best to follow the NO-BACK-UP rule, since backing up can damage the internal workings of some fuzes.

CAUTION: During transporting of mortar ammunition in mortar carriers, rounds will be stored in ammo racks in their fiber containers with seals unbroken. During firing, only the number of rounds required for the mission will be prepared for immediate expenditure. Protect the propelling charges and ignition cartridge of these rounds by slipping one end of a fiber container over the base of the round. Unused rounds will be repacked, unused charges will be kept in a container (ammo box) with lid closed and disposed of in accordance with unit SOP.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 1, page 12, para 14-20)

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TASK NUMBER: 071-322-4206

PERFORM OPERATOR MAINTENANCE ON 107-MM (4.2-IN) MORTAR AND EQUIPMENT

CONDITIONS:

Given a 107-mm (4.2-in) mortar complete, sight, aiming post light, sight light, M45 boresight, special tools and equipment listed in FM 23-92 (chapter 1, section III) and TM 9-1015-215-12.

STANDARDS:

Inspect, clean, spot paint, and lubricate the mortar using procedures outlined in FM 23-92 (chapter 1, section III) and TM 9-1015-215-12 so that no deficiencies correctable by the crew are present. If a defective item is found that cannot be corrected by operator or if the elevation or traversing mechanism, shock absorber, or optical parts have been immersed in water, notify organizational maintenance personnel immediately.

PERFORMANCE MEASURES:

The comments in these performance measures are general in nature. For specific details on care and cleaning, see TM 9-1015-215-12.

1. **Maintenance when not being used.**

a. Keep a film of preservative lubricating oil on all unpainted metal parts of the mortar and organizational equipment, except in a cold weather environment (FM 31-70). Use a cleaning staff and rags to oil the bore. Oil all other unpainted surfaces with an oily cloth. Keep all surfaces clean and free from rust.

b. To prevent dryness, mold, or mildew on the leather muzzle cover, clean it with saddle soap and apply neat's-foot oil. Newer model muzzle covers are made with a vinyl-coated fabric, and the use of saddle soap and neat's foot oil is not required.

c. To clean the canvas tool rolls, wash them with a mild soap and dry in the shade.

2. **Maintenance just before and during firing.**

a. Before firing, clean and lightly oil the following moving parts with preservative lubricating oil:

(1) Shock absorber slides.

(2) Machined surface of mortar.

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(3) Coupling and sight mount assembly.

(4) Traversing mechanism surface.

(5) Elevating mechanism surface.

b. Clean the top bearing surface of the baseplate assembly, the underbearing surface of the rotator assembly, and the rotator lock socket in the baseplate assembly. Then apply a heavy coat of automotive or artillery grease to these parts.

c. Tighten all nuts, bolts, and screws.

d. Inspect and dry the bore immediately before firing. Swab the bore with clean, dry waste after each 10 rounds fired or after each fire mission. Each day, clean and lubricate the parts listed in 2a, above.

3. **Maintenance after firing.**

a. Clean the cannon as soon as it is cool enough to handle. For the next 2 consecutive days, thoroughly clean the bore with rifle bore cleaner (cleaning compound FSN 6850-224-6663), but do not wipe dry. On the fourth day, clean the bore with rifle bore cleaner and wipe dry. Then saturate a wiping cloth with preservative lubricating oil, wring it out, and run the cloth through the bore several times. Clean weekly with rifle bore cleaner, wipe dry, and oil with PL special.

b. Clean the bridge socket.

c. Clean all parts listed in 2a, above.

d. Tighten all nuts and screws.

e. Remove all rust and repaint those parts requiring it.

f. Coat all unpainted outside surfaces with a light coat of preservative lubricating oil. Apply a few drops of oil to the traversing mechanism. See TM 9-1015-215-12 for information on care and cleaning under unusual conditions.

4. **Maintenance records.** TM 38-750 tells how to complete forms.

NOTE: Notify your immediate supervisor and the organizational mechanic if you detect a defective item which cannot be corrected by cleaning, lubrication, spot painting, or adjustment, or if the following items have been immersed in water:

a. Elevating mechanism.

b. Traversing mechanism.

c. Shock absorber.

d. Optical parts.

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5. **Sighting and fire control equipment.**

a. General.

(1) Inspect all items for cracks, excessive wear, broken parts, and rust. Lightly lubricate moving parts, to exclude switches, so they operate smoothly. Remove rust with crocus cloth and paint the spot, if it is on a painted surface.

(2) Coat nameplates and serial numbers with clear lacquer.

b. Sight unit:

(1) Lenses should be clean and dry; dovetail bracket should be free of burrs or dents; knobs should operate smoothly; deflection/elevation scales should be dry.

(2) Remove dust from lenses with camel's-hair brush; wipe each lens with lens cleaning tissue. Remove grease or oil from the lens with lens cleaning compound. Remove oil from the deflection/elevation scales with waste.

(3) Lubricate sight locking devices with a SMALL amount of PL preservative.

c. Instrument light (M53 or M42):

(1) Rheostat knob should operate smoothly and remain at desired setting; battery case should be dry and free of corrosion and rust; and light bulbs should work. Check cables for bad insulation.

(2) Remove rust from battery contacts with crocus cloth; remove corrosion with toothbrush or waste; wipe cables with clean, dry waste.

d. Aiming post light, M14:

(1) Battery case should be dry and free of corrosion and rust; light bulb should work; switch should operate smoothly and lock at desired setting; filters should be clean; clamp should hold unit firmly to aiming post and not be bent out of shape.

(2) Remove rust from case with crocus cloth; remove corrosion with toothbrush or waste; dry entire item with waste; clean filters with lens tissue.

e. Aiming post, M1A2:

(1) Check for proper fit; check joints to be sure they are not dented or bent out of shape; check for cleanliness, and scratched or chipped body.

(2) Clean with dry waste; sand any chips with crocus cloth; repaint as necessary.

f. Carrying cases:

(1) Check rubber seal; be sure that latches are tight and not bent or broken; check case for cleanliness, and scratched or chipped parts.

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(2) Clean case with brush and waste; spot paint as necessary.

REFERENCES:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 1, page 11, para 8-1 thru 8-13)
FM 31-70, Basic Cold Weather Manual, C1, Apr 68 (chap 6, page 122, para 6-14)
TM 9-1015-215-12, Operator and Organizational Manual, C1 thru C8, Jul 66 (chap 3, page 3-6, para 3-6)

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TASK NUMBER: 071-322-4207

REMOVE A MISFIRE FROM THE 107-MM (4.2-IN) MORTAR (GROUND-MOUNTED)

CONDITIONS:

Acting as the gunner, given a ground-mounted 107-mm mortar prepared for firing, one wooden dummy round, an assistant gunner, an ammo bearer, and an ammo bearer/driver.

STANDARDS:

Perform misfire procedures within 7 minutes, IAW performance measures below.

PERFORMANCE MEASURES:

1. During firing, the first crew member who notes a misfire has occurred announces in a loud voice, "MISFIRE."

2. Prior to the removal of the misfire from the cannon (barrel), certain things will take place.

a. At the announcement of MISFIRE, all crew members except the gunner will leave the mortar and move to the rear of the mortar position a safe distance (50 meters).

b. When the crew has moved, the gunner moves to the rear of the mortar and kicks the cannon several times to dislodge the round if it should be hanging in the cannon somewhere between the muzzle and the firing pin.

c. If the mortar fails to fire, the gunner moves to the rear where he and the crew wait 1 minute. (This prevents an accident caused by a possible delayed action of the propelling charge.) After waiting 1 minute, the gunner returns to the mortar and checks it for heat. (If the cannon is hot, use water or snow on the outside of it until it cools enough to handle with bare hands. If no water is available, have all soldiers stand clear of the mortar until it cools.)

d. When the cannon is cool enough to handle, the gunner signals for the squad to come forward; at the same time he removes the sight, without disturbing the sight setting, and lays it in the sight case to keep it off the ground.

e. The squad leader, gunner, assistant gunner, and the first and second ammunition handlers are required to remove a misfire.

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(1) If the mortar is in low range, the assistant gunner raises the mortar to its highest position in low range; if it is in high range, he lowers the mortar to the lowest position in high range. The gunner then traverses the mortar to the extreme left. THIS PLACES THE CANNON IN THE SAFEST AND EASIEST POSITION FOR HANDLING DURING THE REMOVAL OF A MISFIRE.

CAUTION: Keep body and head away from the front of the cannon.

(2) The gunner and assistant gunner place their hands around the cannon between the coupling and sight mount assembly and the muzzle end of the cannon. While the gunner pulls, the assistant gunner pushes on the cannon, causing the cannon, standard, and bridge assemblies to cant to the left and disengage the right tube cap trunnion.

(3) The first and second ammunition handlers carefully lift the cannon out of the bridge socket. Then they rest the base end of the cannon on the bridge-carrying handle. They are careful not to get behind the cannon at any time. The gunner and the assistant gunner then return the cannon, standard, and bridge assemblies to an upright position.

(40 The assistant gunner places his hands around the cannon, making sure no part of his hands extend over the rim of the muzzle.

(5) The gunner faces to the front, places his left hand underneath the cannon, and extends his right arm over it, placing his right hand on its side. The first and second ammunition handlers raise the cannon to the horizontal position, and as the standard begins to tilt, the gunner places his right hip against the traversing assembly slide and holds the weight of the cannon and standard assembly until the round is removed (figure 1).

(6) The first and second ammunition handlers carefully lift the base end until the cannon is horizontal. Once raised, the cannon is not lowered until the misfire is removed (figure 2).

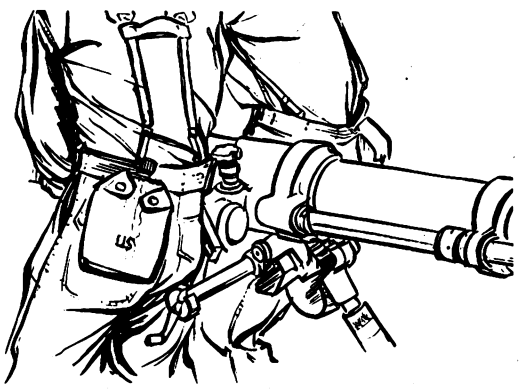

Figure 1.

Figure 2.

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(7) When the cannon reaches the horizontal position, the assistant gunner extends the thumbs of both hands over the muzzle. The first and second ammunition handlers continue to lift the cannon. Under no circumstances, will the base end of the cannon be lowered below the horizontal until the cartridge has been removed from the cannon. As the round slides forward, the assitant gunner, with his hands cupped around the muzzle of the cannon, stops the round with his thumbs, being careful not to touch the fuze. He removes the round and places it carefully in the locally designated area for misfires a safe distance from the mortar position. If the round does not slide out of the cannon freely, do not attempt to remove it. Place the cannon containing the round in a safe area and call direct support unit maintenance personnel.

(8) After the round is removed, the first and second ammunition handlers shake the cannon to dislodge any foreign matter. Then they reseat it in the rotator assembly. The cannon, bridge, and standard assemblies must be tilted to the left in order to reposition the cannon.

(9) The assistant gunner swabs the bore.

(10) The gunner and assistant gunner relay the mortar. Firing is resumed.

f. The first ammunition handler replaces the safety pin (if any) in the misfired round and inspects the round to determine the cause of the firing malfunction; for example, burrs, rust, dirt, or defective striker point. If he can see no reason for the firing malfunction, he places the round aside for later disposition by qualified personnel.

3. Listed below is a short summary of what each crew member must do.

GUNNER	ASSISTANT GUNNER	AMMO BEARER/DRIVER
Tests barrel for heat and lls rest of the squad forward.		
Removes sight and places sight box, without disturb-g sight setting.		
	If mortar is in low range, raises the mortar to its high-est position in low range. If it is in high range, lowers the mortar to the lowest position in high range.	
Traverses the mortar to the treme left.		
Places hands around can-on between the coupling and ght mount assembly and the uzzle end of the cannon.	Same as gunner.	

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GUNNER	ASSISTANT GUNNER	AMMO BEARER/DRIVI
6. Pulls the cannon to the left, disengaging the right tube cap trunnion.	Pushes the cannon, disengaging the right tube cap trunnion.	
7.		Lifts the cannon out of th bridge socket. Rests the bar end of the cannon on bridg carrying handle.
8. Returns cannon, standard, and bridge assemblies to their original positions.	Same as gunner.	
9.	Places hands around the cannon, making sure no part of his hands extend over the rim of the muzzle.	
10. Faces to the front. Places left hand underneath cannon. Extends right arm over cannon. Places right hand on side of cannon. Places right hip against traversing assembly slide and holds weight of cannon and standard assembly until round is removed.		Raises cannon to horizont position as standard begins tilt.
11.	Catches round with thumbs as it slides out of cannon being careful not to touch fuze. Disposes of according to unit SOP.	Carefully lifts base end un cannon is horizontal. On raised, cannon is not lower until misfire is removed.
12.		If round fails to fall out, plac cannon in safe area and ca direct support.
13. Re-lays mortar.	Swabs the bore.	
14. Resumes firing.		

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30 (chap 2, page 58, para 59)

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TASK NUMBER: 071-322-4208

REFER SIGHT AND REALINE AIMING POSTS

CONDITIONS:

You are the gunner on a 107-mm mortar. Given a mounted 107-mm mortar complete with sight and aiming posts out on a deflection of 2800 and two assistants to act as assistant gunner and ammo bearer.

STANDARDS:

Within 100 seconds, realine aiming post IAW the performance measures below.

PERFORMANCE MEASURES:

1. To refer the sight and realine the aiming posts, take the following actions:

a. The mortar is mounted and alined on the aiming posts with a deflection of 2800 and elevation 900, all bubbles level.

b. When the gunner is ready to start, he will be given an administrative fire command to move the mortar from center of traverse. This command will contain a deflection between 2860 and 2740. (Example: "Number two, deflection 2760, elevation 900.")

c. The gunner will place the data on the sight, and relay on the aiming posts using the traversing handwheel (bridge will not be shifted).

d. When the mortar has been relaid with the new deflection and elevation and all bubbles level, the gunner will be given a new fire command. (Example: "Deflection 2775, refer, realine aiming posts.")

e. Upon receiving this last fire command, two actions take place:

(1) The ammo bearer will move out on the double to realine the aiming posts on the new deflection. As he arrives at the near aiming post he will knock it down and continue on to the far post. There he will await the signals from the gunner (fig 1).

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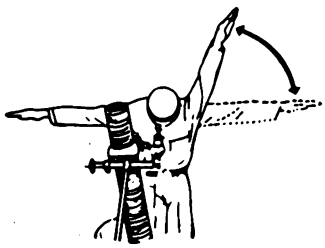
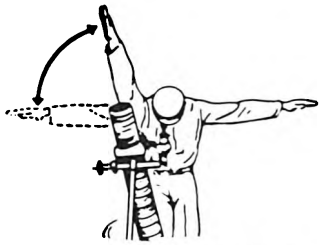
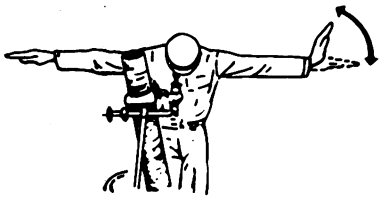


A. MOVE AIMING POST TO THE LEFT.

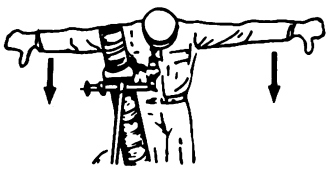


B. MOVE AIMING POST TO THE RIGHT.

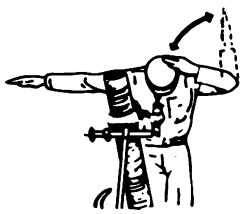


C. MINOR MOVEMENT OF THE POST TO THE LEFT.

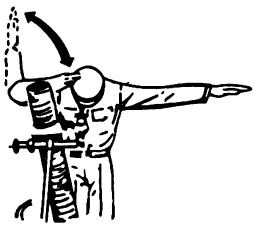
D. MINOR MOVEMENT OF THE POST TO THE RIGHT.



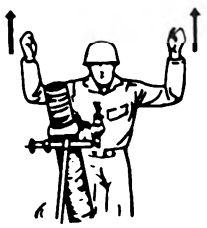
E. DRIVE IN POST.



F. TILT POST TO THE LEFT.



G. TILT POST TO THE RIGHT.



H. POST INCORRECT START OVER.

I. POST CORRECT.

Figure 1.

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(2) The gunner, without disturbing the lay of the mortar, will place the new deflection on the sight using the deflection micrometer knob.

f. After the gunner has placed the data on the sight and the ammo bearer is at the far aiming post, the gunner will aline the aiming post using arm-and-hand signals until he has an alined sight picture. The ammo bearer will move to the near post and the process will be repeated.

g. As soon as the aiming posts are alined, the gunner will center the traversing bearing and, with the help of the assistant gunner, shift the bridge and relay on the aiming posts.

h. After the mortar is relaid on the aiming posts and all bubbles are level, the gunner steps away from the mortar and announces "UP."

NOTE: The time will begin with the command "REFER, REALINE AIMING POSTS" and end when the gunner announces "UP."

2. After the gunner announces "UP," the mortar will be checked for the following:

a. Time did not exceed 100 seconds.

b. Traversing handwheel was not turned before the aiming posts were realined.

c. Sight is correctly set for deflection and elevation.

d. Vertical crossline is not more than 2 mils off the left edge of the aiming posts.

e. Traversing bearing is not more than 2 turns right or left of center.

f. Bubbles on sight are level (within outer red lines).

REFERENCES:

FM 23-92, 4.2-inch Mortar, M30, Jun 70 (chap 2, page 51-55, para 51-52; page 90; and chap 4, page 63, para 66-67)

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TASK NUMBER: 071-322-4209

RECIPROCALLY LAY MORTAR USING M2 AIMING CIRCLE AND PLACE OUT AIMING POSTS

CONDITIONS:

Given a 107-mm mortar mounted on an initial azimuth with sight set on a deflection of 3200 for M53 sight (or 0 for M34A2 sight) and 0900 mils elevation; mortar laid on a direction stake with the traversing mechanism centered; assistant gunner, ammo bearer, and aiming posts; and a prepared M2 aiming circle and operator (to give commands). The mounting azimuth will not be less than 150 mils nor more than 200 mils away from initial azimuth.

STANDARDS:

1. Reciprocally laying mortars: Within 95 seconds, set the sight on last deflection given and 0900 mils elevation with bubbles level. The vertical line of sight will be within 1 mil of the center of the head of the aiming circle.

2. Placing out aiming posts: Within 2 minutes after the command, "DEFLECTION 2800, REFER, PLACE OUT AIMING POSTS," aline both aiming posts on a deflection of 2800 mils, so that only the near post can be seen. The vertical crossline of the sight will be alined on the left edge of the near stake. The far aiming post will be approximately 100 meters from the mortar and the near post half the distance between mortar and far post.

PERFORMANCE MEASURES:

1. To reciprocally lay mortar:

a. Mount the mortar and lay on direction stake with sight set on 3200 mils deflection and 0900 mils elevation.

b. M2 aiming circle (AC) operator prepares aiming circle on azimuth of not less than 150 mils nor more than 200 mils from initial azimuth.

c. AC operator gives command, **"AIMING POINT THIS INSTRUMENT."** (See figure 1.)

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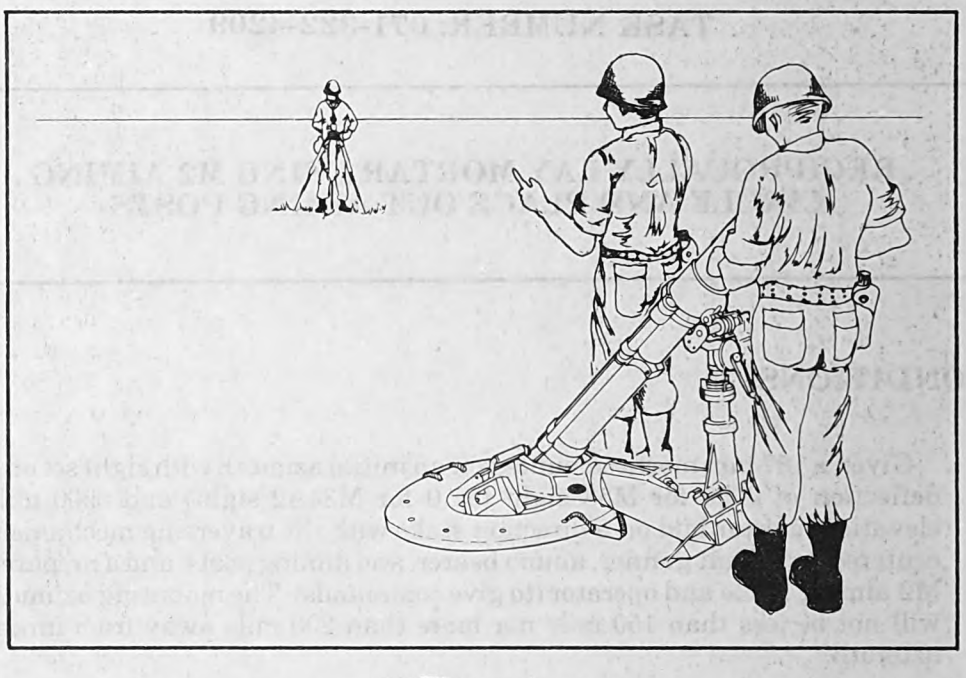

Figure 1.

NOTE: Gunner will repeat all commands from the AC operator.

d. Gunner refers sight (using the micrometer knob) to the AC and replies **"AIMING POINT IDENTIFIED."** (See figure 2.)

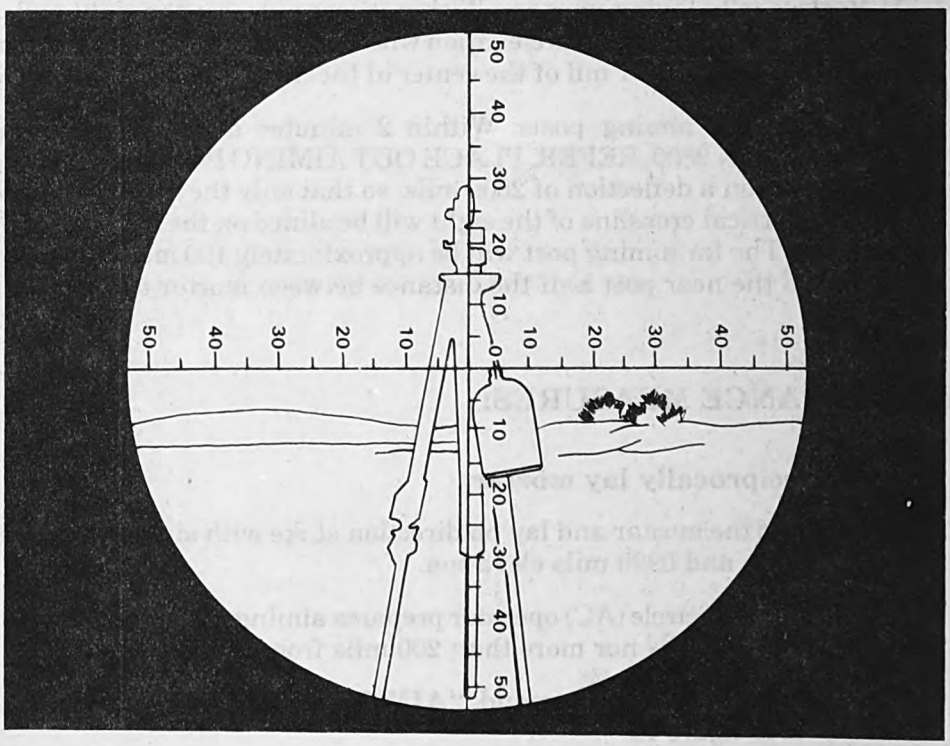

Figure 2.

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e. AC operator announces deflection (example: **"NUMBER ONE, DEFLECTION, 2315").**

f. Gunner places data on sight using red scale and re-lays on center of AC head, and announces, **"READY FOR RECHECK."**

g. AC operator gives new deflection and process is repeated until gunner announces, **"NUMBER ONE, ZERO (OR ONE) MILS, MORTAR LAID."**

NOTE: In laying a carrier-mounted mortar, if the first deflection given by the AC operator would cause the turntable and mortar to be moved from center of indexing gear, the carrier is shifted and the ammo bearer may repeat the message to overcome engine noise during exchange of deflections.

2. To place out aiming posts:

a. As soon as the gunner announces, **"ZERO (OR ONE) MILS, MORTAR LAID,"** the AC operator gives the command, **"SECTION, DEFLECTION 2800, REFER, PLACE OUT AIMING POSTS."**

b. Gunner refers sight using deflection micrometer knob and indexes 2800 deflection on the red scale (this will move only the sight without moving the barrel).

c. Ammunition bearer moves out with aiming posts (far post at 100 meters; near post at 50 meters).

d. Gunner directs ammunition bearer in placing out the aiming posts using arm-and-hand signals (fig 3) so he has an alined sight picture (fig 4).

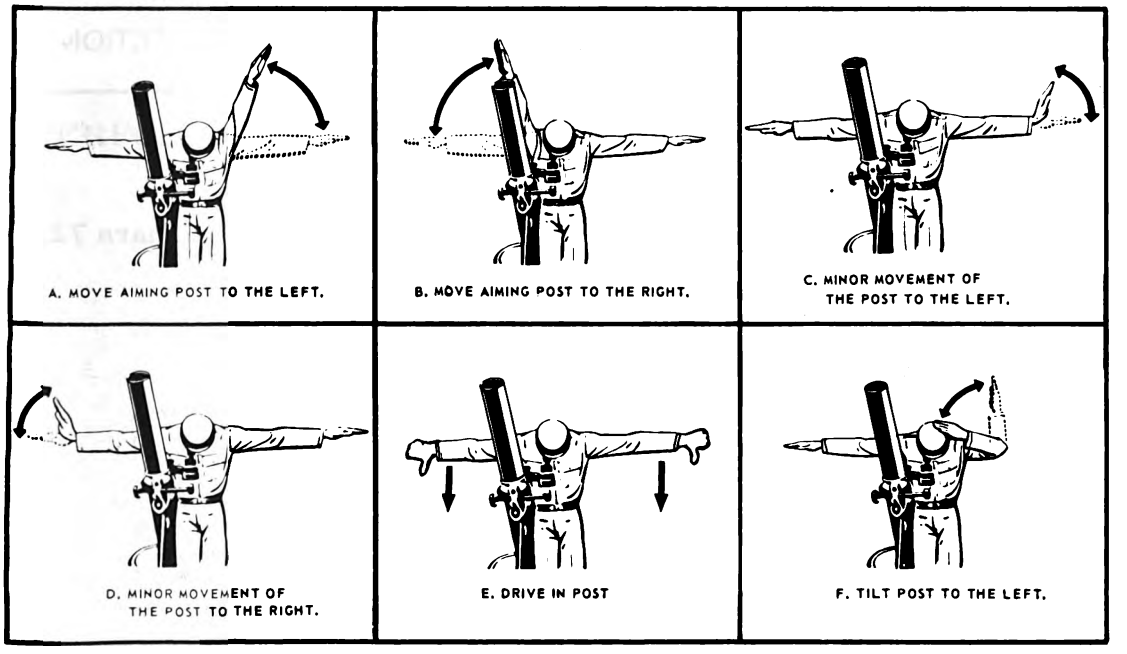
A. MOVE AIMING POST TO THE LEFT.
B. MOVE AIMING POST TO THE RIGHT.
C. MINOR MOVEMENT OF THE POST TO THE LEFT.
D. MINOR MOVEMENT OF THE POST TO THE RIGHT.
E. DRIVE IN POST
F. TILT POST TO THE LEFT.

Figure 3.

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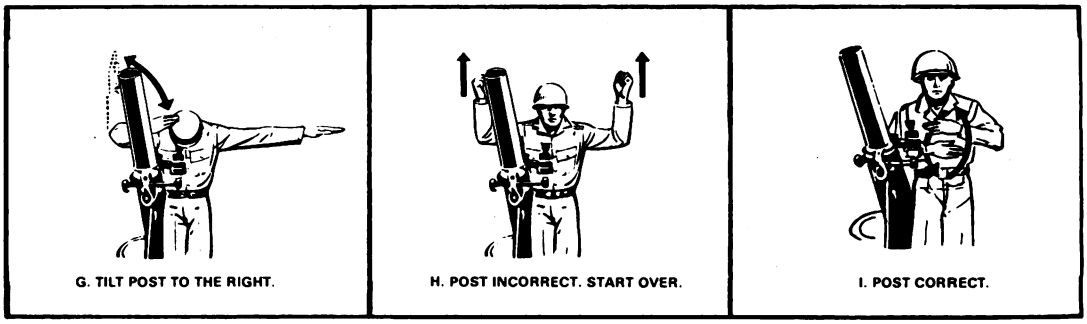

Figure 3. (CONT).

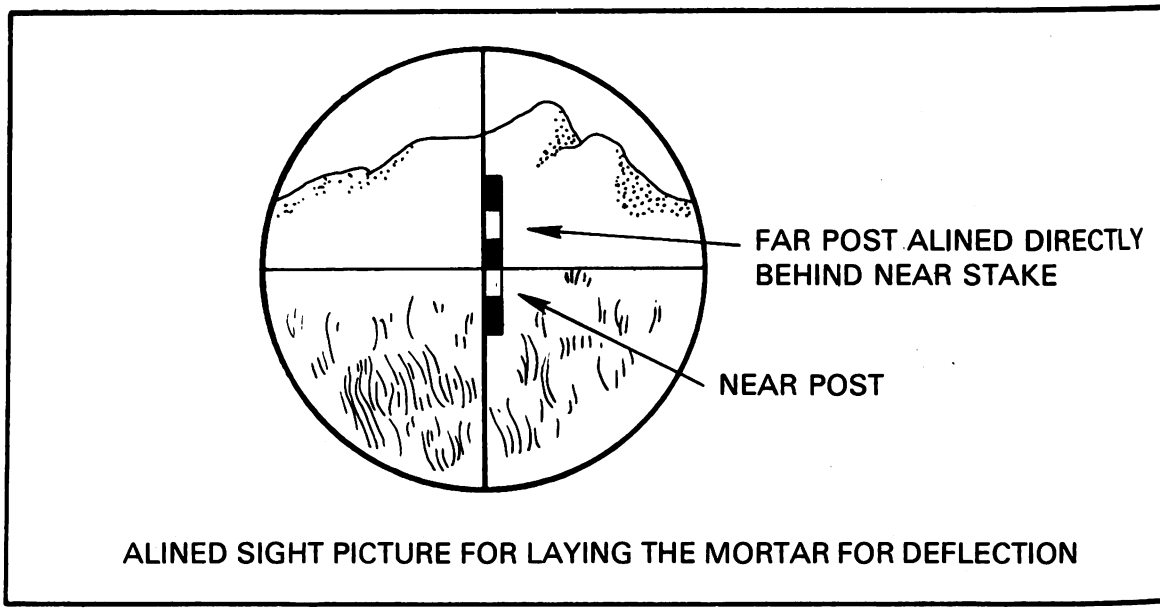

Figure 4.

REFERENCES:

FM 23-92, 4.2-Inch Mortar, M30, Jun 70 (chap 2, page 67, para 72; chap 4, page 105, para 120)

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TASK NUMBER: 071-322-4210

MANIPULATE MORTAR FOR TRAVERSING FIRE (GROUND- OR CARRIER-MOUNTED)

CONDITIONS:

Given a mounted 107-mm (4.2-in) mortar laid on aiming posts with 2800 mils deflection and 0900 mils elevation, an assistant gunner, and firing data given in the form of an initial fire command for traversing mission (number of rounds specified must be four). Gunner will prepare gun to traverse left (right) but will not re-lay on aiming posts until fire command is issued.

STANDARDS:

Within 50 seconds, the gunner will insure sight is correctly set for elevation, command "FIRE" for each round, and traverse between rounds (number of turns to be given in initial fire command). Mortar will be within 20 mils of aiming posts when traversed back number of turns given in fire command.

PERFORMANCE MEASURES:

1. Mortar is mounted with deflection 2800 mils and elevation 0900 mils on sight and laid on aiming posts with traversing bearing centered.

2. Gunner is given command "PREPARE TO TRAVERSE RIGHT (LEFT)."

3. Gunner traverses mortar left (right) until traversing assembly is stopped, then backs off two turns. He does not re-lay on the aiming posts until fire command is given.

4. When gunner is ready, he is given a fire command (example: "FOUR ROUNDS, TRAVERSE RIGHT THREE TURNS, CHARGE 25 4/8, ELEVATION 0900"). Gunner repeats each element of fire command.

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5. Gunner sets data on sight, lays mortar on aiming posts and commands "FIRE ONE." He then traverses number of turns specified, commands "FIRE TWO," and repeats process until all rounds are fired.

NOTE: To check for proper lay or error, traverse mortar back total number of turns and crosslevel sight; the vertical crossline of the sight should be no more than 20 mils off the left edge of aiming posts.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 2, page 56, para 54)

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TASK NUMBER: 071-322-4212

PLACE CARRIER-MOUNTED 107-MM MORTAR INTO ACTION

CONDITIONS:

You are the gunner on a 107-mm mortar, given a 107-mm mortar carrier, 107-mm mortar complete and mounted in the travel position, sight (M53 or M34A2), direction stake, and one soldier to act as assistant gunner. Each member of the mortar crew will perform this task acting as the gunner.

STANDARDS:

The mortar will be placed into action within 70 seconds IAW the performance measures below.

PERFORMANCE MEASURES:

1. To place the carrier-mounted mortar into action:

a. The direction stake will be in place, 25 meters to the rear of the mortar carrier.

b. Mortar will be secured in the traveling position with the tiedown strap in place and tightened (figure 1).

c. The sight will be in its latch case in its stowage position.

d. The top hatch covers will be closed and latched.

e. Gunner and assistant gunner will be seated in their travel position.

NOTE: The ramp may be down to allow the squad leader/grader to observe the actions better.

2. At the command, "PREPARE FOR ACTION," the following actions take place.

a. Gunner and assistant gunner will reach up and grasp the hatch cover chains; the gunner will report, "I AM READY."

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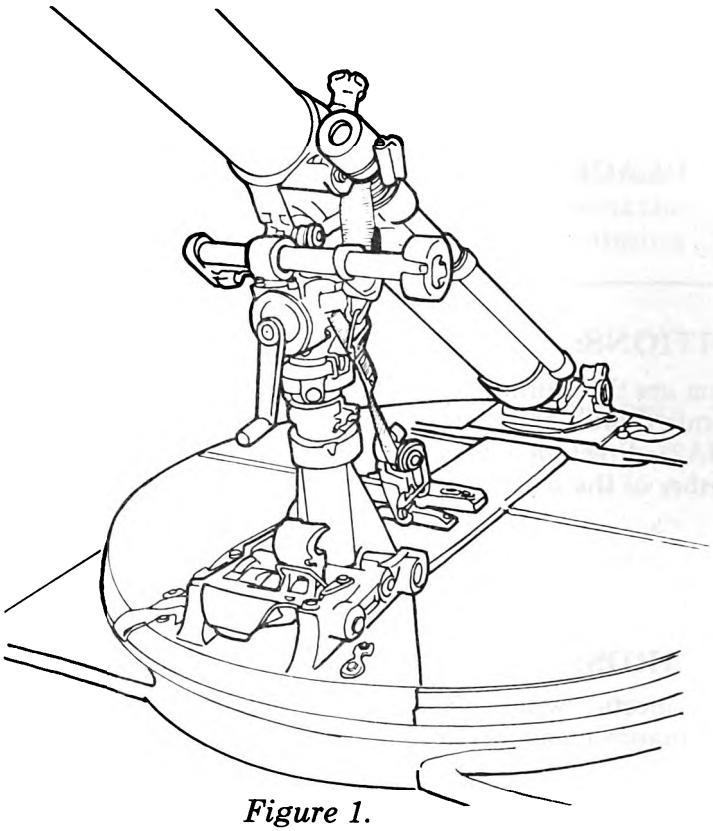

Figure 1.

b. The command, "ACTION," is given and mortar is placed into action as follows:

(1) The gunner and assistant gunner will pull down on the chains, and unlatch and fold back the hatch covers, making sure they are latched back.

(2) The assistant gunner will release the tiedown strap ratchet, and remove and stow the tiedown strap (figure 2).

(3) The gunner will install the sight extension, remove the sight from the sight case, and place the correct data on the sight.

M53	M34A2
A. Deflection 3200	A. Deflection 0
B. Elevation 900	B. Elevation 900

(4) After stowing the tiedown strap, the assistant gunner moves to the front of the mortar, places his right shoulder under the barrel, and pushes up until the standard support locks in the raised position (figure 3). He will then elevate the mortar approximately 15 turns.

(5) The gunner with the assistance of the assistant gunner will level for elevation, traverse, and cross-level until the gunner has an alined sight picture on the direction stake and all bubbles are level.

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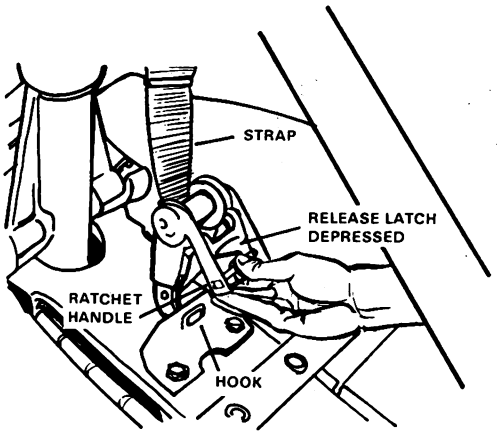

Figure 2.

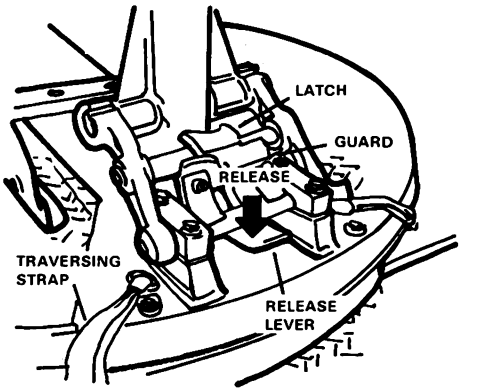

Figure 3.

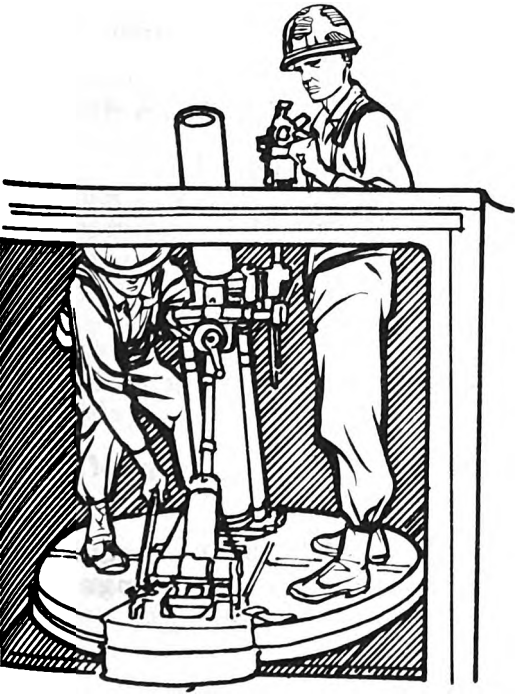

Figure 4.

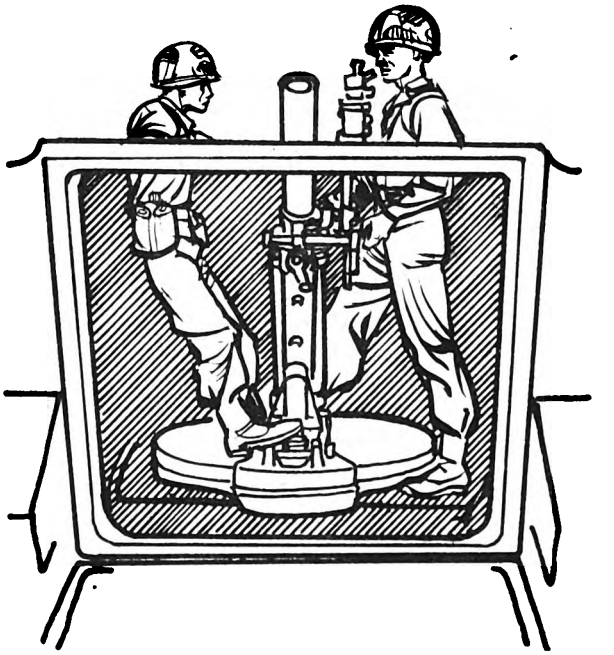

Figure 5.

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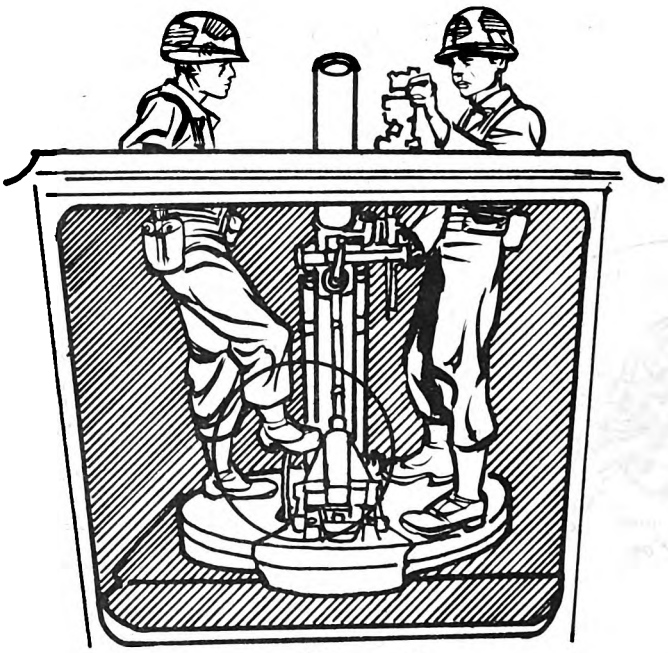

Figure 6.

(6) If it is necessary to shift the turntable to aline on the direction stake, the assistant gunner will release the turntable locking handle and assist the gunner in shifting the turntable (figure 4 and 5). The assistant gunner will relock the turntable on word from the gunner (figure 6).

(7) After making final checks and adjustments, the gunner will announce, "UP," and step away from the gun.

(8) Time is taken from word "ACTION" to word "UP."

3. The squad leader checks the mortar for the following:

a. Sight is set correctly for deflection and 900 elevation.

b. Cross-level and elevation bubbles are centered.

c. Traversing assembly slide is within two turns of center.

d. Mortar standard assembly support is not in the firing position (raised).

e. Vertical crossline of sight is no more than 2 mils off left edge of the directional stake.

NOTE: In the past, FM 23-92, 4.2-Inch Mortar, M30, did not require the mortar to be laid on a directional stake. This is a change in procedure which will be in the next change to the manual.

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 2, page 61, para 63; chap 4, page 97, para 116)

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TASK NUMBER: 071-322-4216

REMOVE A MISFIRE FROM THE 107-MM MORTAR (CARRIER-MOUNTED)

CONDITIONS:

Acting as the gunner, given a carrier-mounted 107-mm mortar prepared for firing, one wooden dummy round, an assistant gunner, an ammo bearer, and an ammo bearer/driver.

STANDARDS:

Perform misfire procedures within 7 minutes, IAW performance measures below.

PERFORMANCE MEASURES:

1. During firing, the first crew member who notes a misfire has occurred announces, in a loud voice, **"MISFIRE."**

2. Prior to the removal of the misfire from the cannon (barrel), certain actions will take place.

a. At the announcement of **MISFIRE,** all crew members except the gunner will leave the carrier and move to the rear of the mortar position a safe distance (50 meters).

b. When the crew has left the carrier, the gunner moves to the rear of the mortar and kicks the cannon several times to dislodge the round if it should be hanging in the cannon somewhere between the muzzle and the firing pin (figure 1).

c. If the round does not fire after the cannon is kicked, the gunner will leave the carrier and join the rest of the crew. The gunner will then wait 1 minute. (This 1-minute wait is to allow the round to fire should there be a delayed action of the propelling charge.)

d. After the 1-minute wait, the gunner returns to the carrier and performs the following:

(1) Checks the cannon for heat. Barehanded, using the fingertips, and starting at the muzzle, he lightly touches the cannon. If the cannon is cool to warm, he then continues down the cannon to the base (figure 2).

(2) If he determines the cannon is cool enough to handle, he calls the assistant gunner forward.

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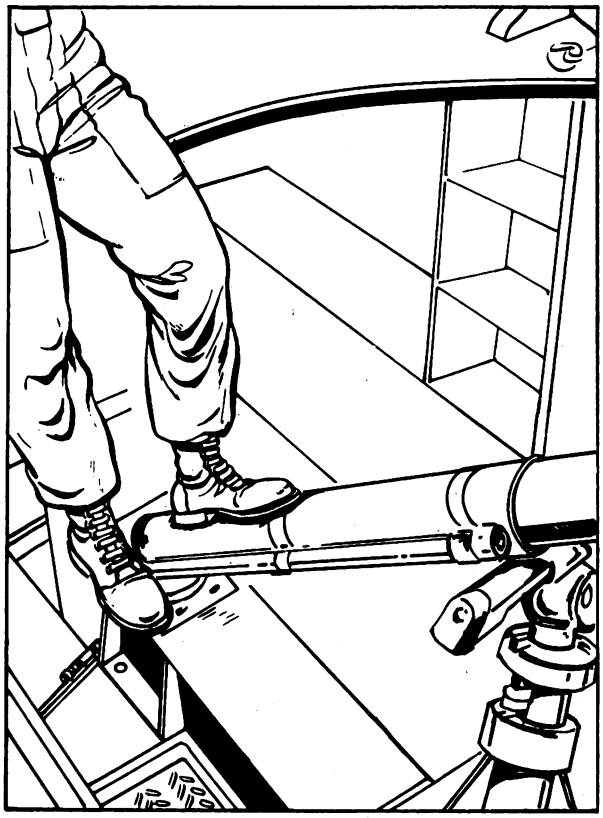

Figure 1.

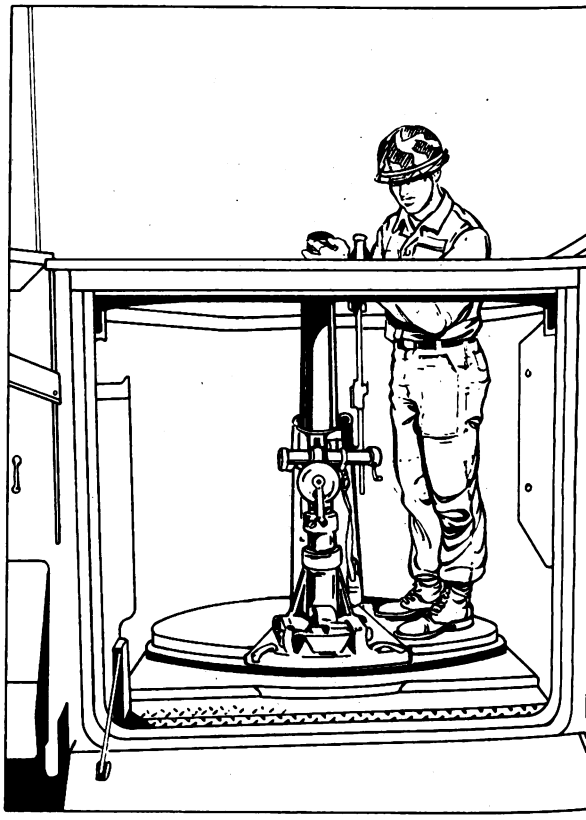

Figure 2.

NOTE: If the ramp is up during firing and a misfire occurs, the driver also remounts the carrier and lowers the ramp.

(3) While the crew is coming forward, the gunner will remove the sight and sight extension and lay it out of the way.

(4) The gunner then elevates or depreses the tube to the lowest elevation in high range or the highest elevation in low range, **minus two turns.** He never unlocks the elevating mechanism cam. At the highest elevation in low range, some cannons will hit the crossbar during removal. Depressing the cannon two turns insures clearance. At the lowest elevation in high range, no such problem exists.

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e. The gunner and assistant gunner center the mortar on the traversing asembly slide and on the turntable.

f. The gunner and assistant gunner gently lower the standard support assembly. (This step is necessary in order to clear the roof support.) The assistant gunner supports the cannon while it is lowered.

g. The ammo handler removes the detent pins.

(1) The driver and ammo handler grasp the base of the cannon with the driver on the left. They lift the cannon up on command of the gunner who has his right arm around the cannon and the traversing wheel body in his back or on his hip. The assistant gunner positions his hand near the muzzle with the right hand underneath the cannon and his left hand above the cannon.

(2) The gunner and assistant gunner make certain that the muzzle end of the cannon does not hit the roof support, while the driver and ammo handler raise the rear of the cannon rapidly, but gently, so that the cannon is only briefly masked by the roof structure.

CAUTION: The ammunition handler and driver must stay clear of the rear of the cannon. Once they have started up with the cannon, it is not lowered below the horizontal until the round is removed.

(3) When the cannon has reached the horizontal, the gunner and assistant gunner move slowly forward. As the ammo handler and driver continue to raise the rear of the cannon, the assistant gunner extends his thumbs slightly beyond the muzzle but not inside the cannon. This allows the assistant gunner to grasp the round without touching the nose of the fuze.

(4) The assistant gunner removes the round and places it in a safe place. (If a safe place is unavailable, the assistant gunner places the round in a position where the carrier will shield the troops.) If the round does not come out, the cannon is disengaged and placed in a safe position for examination by qualified troops. NEVER TRY TO PRY A ROUND OUT OF THE CANNON.

h. The driver and ammo handler shake the cannon to dislodge any foreign matter. The squad then prepares the mortar for firing, and the assistant gunner swabs the bore.

i. The ammo handler examines the round in order to determine the cause of the firing malfunction. If the cause is corrected, the round is fired; if the cause cannot be determined or corrected, the round is moved (safety pins, if any, are replaced) to a safe position away from all troops, marked, and reported for disposition by qualified troops.

3. Listed below is a short summary of what each crew member must do.

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GUNNER	ASSISTANT GUNNER	AMMO BEARER/DRIVE
1. Jars cannon vigorously; if round fails to fire joins rest of crew and waits 1 minute.		
2. Remounts carrier.		(Driver) Remounts carrier, lo ers ramp if necessary.
3. Tests barrel for heat and calls rest of the squad forward.		
4. Removes sight and sight extension and places on roof of carrier.		
5. Center mortar on traversing assembly slide and turntable.	Assists gunner.	
6. Elevates or depresses tube to lowest elevation in high range or highest in low range **minus two turns.**		
7. Lowers standard assembly support.	Assists gunner.	
8.		Removes detent pins.
9. Right arm around cannon with traversing wheel in his back or on his hip.	Positions his hands near muzzle (right hand underneath, left hand over).	
10.		Driver and ammo bearer rai cannon to horizontal positio
11.	Catches round with thumbs as it slides out of cannon, being careful not to touch fuze. Disposes of according to unit SOP.	
12.		If round fails to come o place cannon in safe area a call direct support.
13.	Swabs the bore.	
14. Replaces sight and resumes firing.		

REFERENCE:

FM 23-92, 4.2-Inch Mortar, M30, C1, Jun 70 (chap 3, page 89, para 93)

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TASK NUMBER: 071-321-4002

BORESIGHT MORTAR FOR ELEVATION USING THE M2 COMPASS

CONDITIONS:

Given an M2 compass and mounted mortar complete with sight.

STANDARDS:

Boresight the mortar for elevation to a 1-mil accuracy within 5 minutes.

PERFORMANCE MEASURES:

Calibration for elevation using the M2 compass when boresight is not available:

1. Mount the mortar on level ground and center the traversing bearing.

2. Elevate the barrel to an elevation of 800 mils.

   a. Set the elevation of 800 on the elevation scale in the M2 compass.

   b. Turn the compass on its left side as when reading angle of site and lay it on the top of the barrel.

   c. Elevate or depress the mortar until the bubble is centered in the vial.

3. Crosslevel the mortar.

4. Center the elevation bubble of the sight by turning the elevation micrometer knob on the sight unit.

5. If the reading of the elevation scale of the sight is not 800 mils, and the reading on the elevation micrometer is not 0, make adjustments for elevation on the elevation scale and micrometer knob.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 1, page 29, para 33)

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TASK NUMBER: 071-321-4007

LAY MORTAR FOR DIRECTION USING M2 COMPASS (CARRIER-MOUNTED)

CONDITIONS:

Given an M2 compass, a prescribed azimuth, squad members, carrier-mounted mortar complete with sight, aiming posts, and compass stake.

STANDARDS:

Deflection to be placed on mortar sight will be determined to within 10 mils.

PERFORMANCE MEASURES:

1. Laying the mortars on a mounting azimuth with the M2 compass is not as accurate as the aiming circle method; it does permit the squad to begin an adjustment on a target very quickly.

2. The squad leader places his compass on a steady object (compass stake) located away from the carrier or any metal object that could affect the compass needle. He uses the compass as an aiming point for the base mortar.

a. The carrier is moved into position and the mortar is pointed in the direction of fire indicated by the squad leader. The squad leader then:

(1) Measures the grid azimuth to the sight of the base mortar.

(2) Subtracts the grid azimuth on which the mortar is to be laid from the grid azimuth, which is measured to the mortar (adding 6400, if necessary).

(3) Announces the remainder (subtracting 3200, if necessary when using the M34A2 sight) as DEFLECTION (figure 1).

b. The gunner sets the announced deflection on his sight and lays on the aiming point - the compass (figure 1). Insuring that the traversing assembly slide is centered and that the mortar is centered to the rear of the carrier, he directs the driver to pivot the carrier until the approximately correct sight picture of the compass is obtained. With the assistant gunner, the gunner traverses and cross-levels the mortar until the correct sight picture of the compass is obtained. (The traversing mechanism will be within two turns of center.) Only one lay is required when the M2 compass is used. The mortar is now laid on the approximate grid azimuth.

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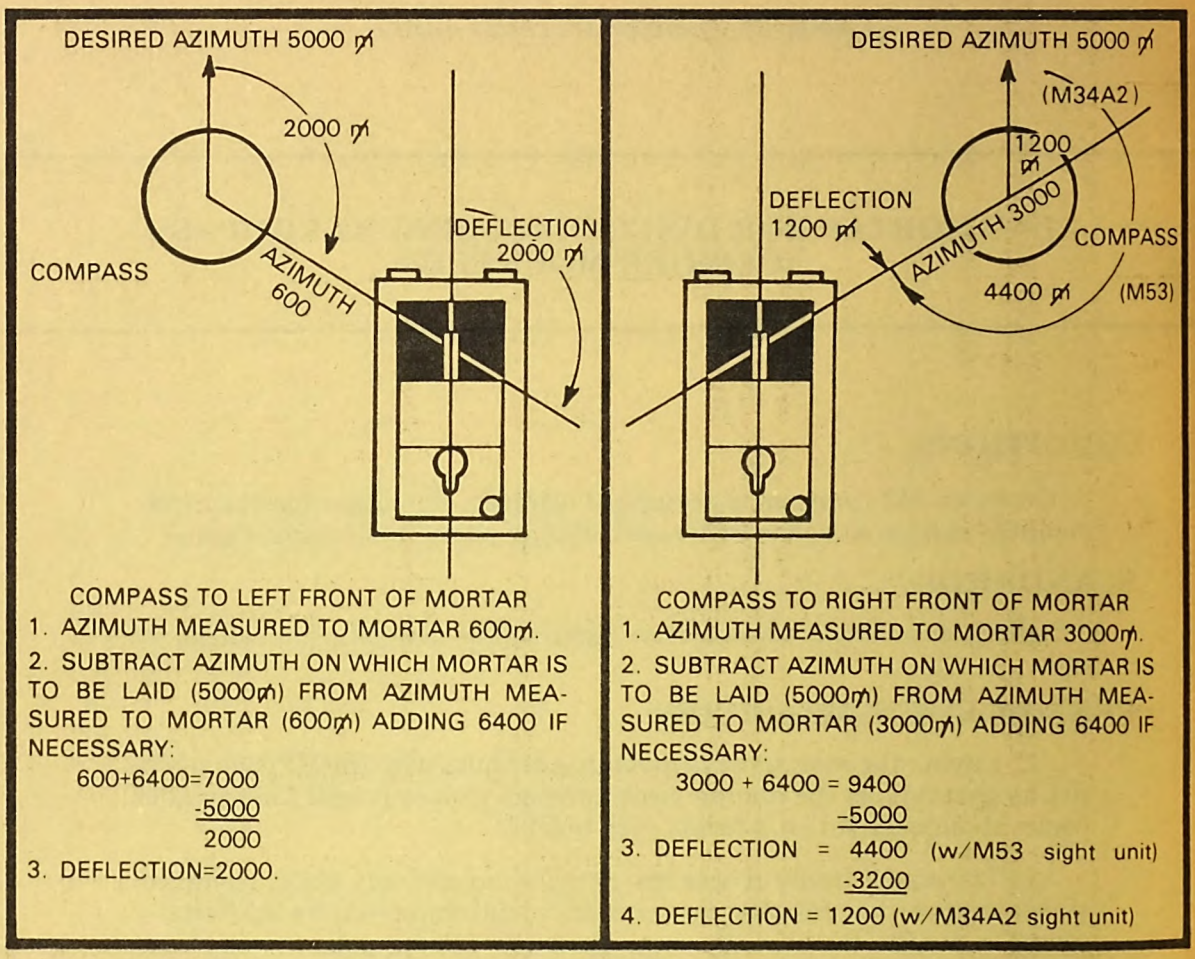
DESIRED AZIMUTH 5000 ⋔
2000 ⋔
COMPASS
AZIMUTH 600
DEFLECTION 2000 ⋔
COMPASS TO LEFT FRONT OF MORTAR
1. AZIMUTH MEASURED TO MORTAR 600⋔.
2. SUBTRACT AZIMUTH ON WHICH MORTAR IS TO BE LAID (5000⋔) FROM AZIMUTH MEASURED TO MORTAR (600⋔) ADDING 6400 IF NECESSARY:
600+6400=7000
-5000
2000
3. DEFLECTION=2000.
DESIRED AZIMUTH 5000 ⋔
(M34A2)
1200 ⋔
DEFLECTION 1200 ⋔
AZIMUTH 3000
COMPASS
4400 ⋔
(M53)
COMPASS TO RIGHT FRONT OF MORTAR
1. AZIMUTH MEASURED TO MORTAR 3000⋔.
2. SUBTRACT AZIMUTH ON WHICH MORTAR IS TO BE LAID (5000⋔) FROM AZIMUTH MEASURED TO MORTAR (3000⋔) ADDING 6400 IF NECESSARY:
3000 + 6400 = 9400
-5000
3. DEFLECTION = 4400 (w/M53 sight unit)
-3200
4. DEFLECTION = 1200 (w/M34A2 sight unit)

Figure 1. Squad laying on initial azimuth, compass-mil method.

3. During the brief time required to lay the mortar, the ammunition handler moves out with the aiming posts. The gunner then guides the ammunition handler in placing out the aiming posts.

NOTE: The carrier-mounted mortar section can be laid on the mounting azimuth using the compass-mil method by first laying the base mortar on the mounting azimuth using the same technique described above. Then, by using the mortar sight, the other mortars are reciprocally laid.

REFERENCES:

FM 23-92, 4.2-Inch Mortar, M30, Jun 70 (chap 3, page 93, para 101)

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TASK NUMBER: 071-321-4008

SUPERVISE SQUAD DURING THE OCCUPATION OF THE FIRING POSITION

CONDITIONS:

Given a mounted mortar complete with sight and aiming posts, squad members with combat equipment, and an actual or training situation.

STANDARDS:

Supervise your squad in the preparation of the mortar, mortar position, and ammunition for actual or simulated fire missions IAW performance measures.

PERFORMANCE MEASURES:

As the squad leader, your duties upon moving into a new position include, but are not limited to:

1. Positioning yourself so that you can properly supervise and control your squad.

2. Supervising the temporary emplacement of the mortar so that all safety checks are accomplished as outlined in tasks: **PERFORM SAFETY CHECKS ON 81-MM MORTAR,** and **PERFORM SAFETY CHECKS ON 107-MM (4.2-IN) MORTAR.**

3. Supervising the boresighting of the mortar using the M45 boresight as outlined in tasks: **BORESIGHT 81-MM MORTAR** and **BORESIGHT 107-MM (4.2-IN) MORTAR,** or an alternate method as outlined in tasks: **BORESIGHT MORTAR FOR DEFLECTION USING THE M2 AIMING CIRCLE,** and **BORESIGHT MORTAR FOR ELEVATION USING THE M2 COMPASS.**

4. Supervising the laying of the mortar to include laying the mortar by the aiming circle or compass, referring the sight to the announced referred deflection, and placing out the aiming posts as outlined in tasks: **RECIPROCALLY LAY MORTAR USING M2 AIMING CIRCLE AND PLACE OUT AIMING POSTS: LAY MORTAR FOR DIRECTION USING THE M2 COMPASS (GROUND-MOUNTED).**

5. Supervising the unloading and positioning of ammunition to include enough of each type so that any ammunition called for by the FDC is readily available to the mortar crew.

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6. Supervising the construction of the mortar position so that it meets the requirements as outlined in task: **CONSTRUCT A MORTAR POSITION.**

7. Supervising the moving of the mortar and ammunition from the temporary position into the mortar pit, re-laying the mortar, placing out aiming posts, and camouflaging the mortar pit.

8. Supervising the establishment of communications as outlined in task: **INSTALL TELEPHONE SET (TA-312/PT OR TA-1/PT)** when wire communication is required.

REFERENCES:

None

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TASK NUMBER: 071-321-4006

ORIENT M2 AIMING CIRCLE AND LAY MORTARS FOR DIRECTION

CONDITIONS:

During daylight, given an M2 aiming circle, declination constant, a prescribed mounting azimuth, and a section/platoon of mounted mortars and crew members.

STANDARDS:

Within 7 minutes, mount and orient the M2 aiming circle so that the 0-3200 line is parallel to the mounting azimuth and all mortars are laid on the mounting azimuth given.

PERFORMANCE MEASURES:

1. The mortar section normally fires a parallel sheaf (figure 1). To get this sheaf, the mortars must be laid parallel. When a section moves into a firing position, the FDC determines the azimuth on which the section is to be laid and notifies the aiming circle (A/C) operator. All mortars are then laid parallel using the aiming circle.

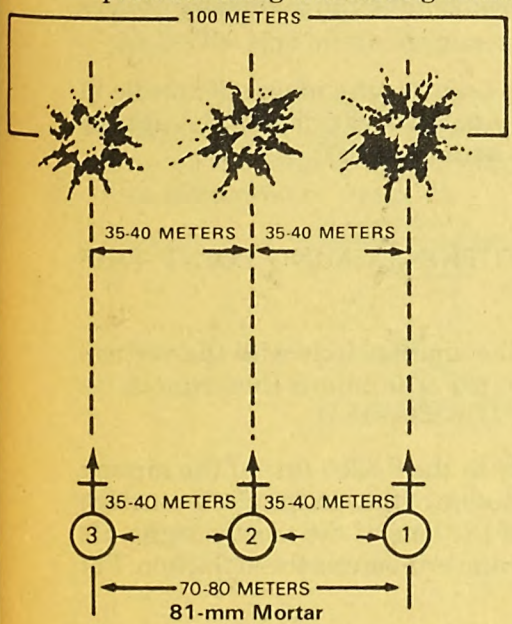

Figure 1a.

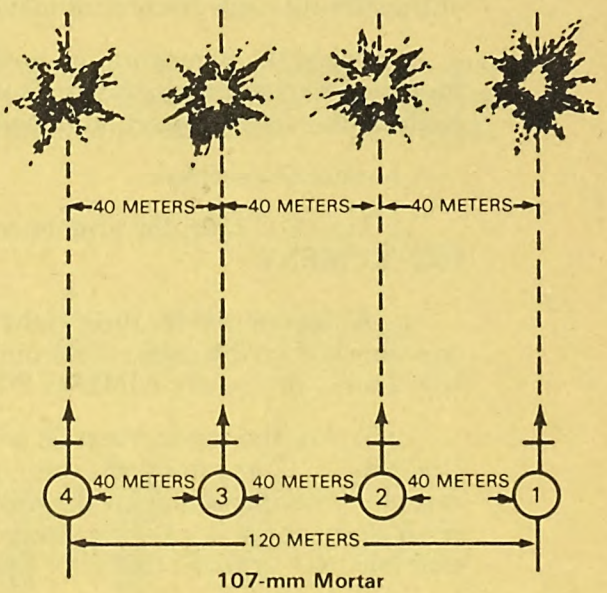

Figure 1b.

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2. The section is laid parallel in two steps:

a. Establish the 0-3200 line of the aiming circle parallel to the mounting azimuth (orienting).

b. Lay the section parallel to the 0-3200 line of the aiming circle (reciprocal laying).

3. Orienting:

a. The FDC normally directs the section leader to lay the mortars parallel on a mounting (grid) azimuth.

b. The section leader receives the command MOUNTING AZIMUTH 5550 MILS from the FDC. The mounting azimuth is 5550 and the aiming circle has a declination constant of 0450 mils. To determine the data to place on the aiming circle, the mounting azimuth must be subtracted from the declination constant. If the declination constant is less than the mounting azimuth, add 6400. The mounting azimuth is then subtracted and the remainder is the data to place on the aiming circle.

Declination constant	0450 mils
	+6400 mils
	6850 mils
Minus the mounting (grid) azimuth	−5550 mils
Remainder to set on aiming circle	1300 mils

c. The A/C operator mounts and levels the aiming circle at a point from which he can see the sights of all the mortars in the section (usually the left front or left rear of the section).

d. He sets the remainder (1300) on the azimuth and micrometer scales of the aiming circle (recording motion).

e. Using the nonrecording motion, he centers the magnetic needle in the magnetic needle magnifier. This orients the 0-3200 line of the aiming circle in the desired direction (mounting azimuth 5550).

4. Laying the section:

a. The A/C operator announces SECTION, AIMING POINT THIS INSTRUMENT.

b. All gunners refer their sights to the aiming circle with the vertical crossline laid on the center of the aiming circle. The gunner then announces NO. 2 (or 1, or 3, or 4), AIMING POINT IDENTIFIED.

c. To lay the mortar barrels parallel to the 0-3200 line of the aiming circle, the A/C operator turns the upper motion of the aiming circle until the vertical crossline is laid on the center of the lens of the mortar sight. He reads the azimuth and micrometer scales and announces the deflection. For example, NO. 2, DEFLECTION 1998.

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NOTE: When the M53 sight is used, it is boresighted at 3200 mils on the red deflection and micrometer scales. All readings from the aiming circle on the mortar sight are set on the red deflection scale and the mortar is laid on the aiming circle using this scale. Readings from 0 to 6399 must be given to the mortar when using the M53 sight. When using the M34A2 sight, the A/C operator never reads a deflection greater than 3199 mils, because the gunners cannot set deflections greater than 3199 mils (on the azimuth scale). Beyond 3200, the A/C operator reads the deflection from the lower row of figures (the back azimuth scale).

d. The gunner repeats the announced deflection (NO. 2, DEFLECTION 1998) and sets it on his sight. Aided by the assistant gunner, he lays the mortar so that the vertical line is once again laid on the center of the aiming circle. After the mortar has been laid and the bubbles are level, the gunner announces NO. 2, READY FOR RECHECK.

e. Using the upper motion of the aiming circle, the A/C operator again lays the vertical crossline of the aiming circle on the lens of the sight. He reads the new deflection from the azimuth and micrometer scales and announces the reading. For example, NO. 2 DEFLECTION 2000.

f. The gunner repeats the new deflection (NO. 2 DEFLECTION 2000) and sets it on his sight. Aided by the assistant gunner, he lays the gun with the vertical crossline of the sight on the center of the aiming circle and announces NO. 2, READY FOR RECHECK.

g. The procedure is repeated until the mortar sight and the aiming circle are sighted on each other with a difference of not more than ONE mil between the deflection readings. When so laid, the gunner announces NO. 2, ZERO MILS (ONE MIL), MORTAR LAID. The barrel is now laid parallel to the 0-3200 line of the aiming circle.

c. The A/C operator uses the same procedure to lay each of the other mortars in the section parallel. When all mortars are parallel to the 0-3200 line of the aiming circle, they are parallel to each other and laid in the desired azimuth (figure 2).

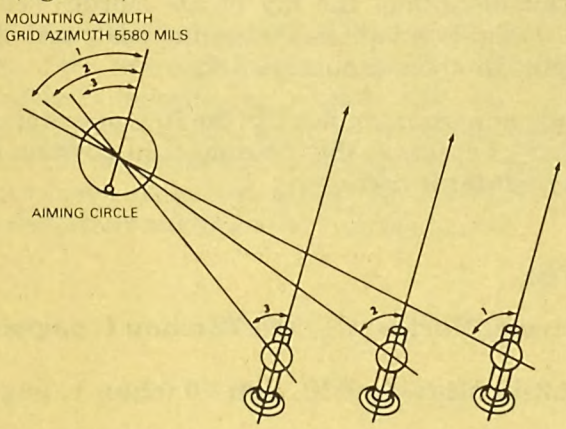

Figure 2a.

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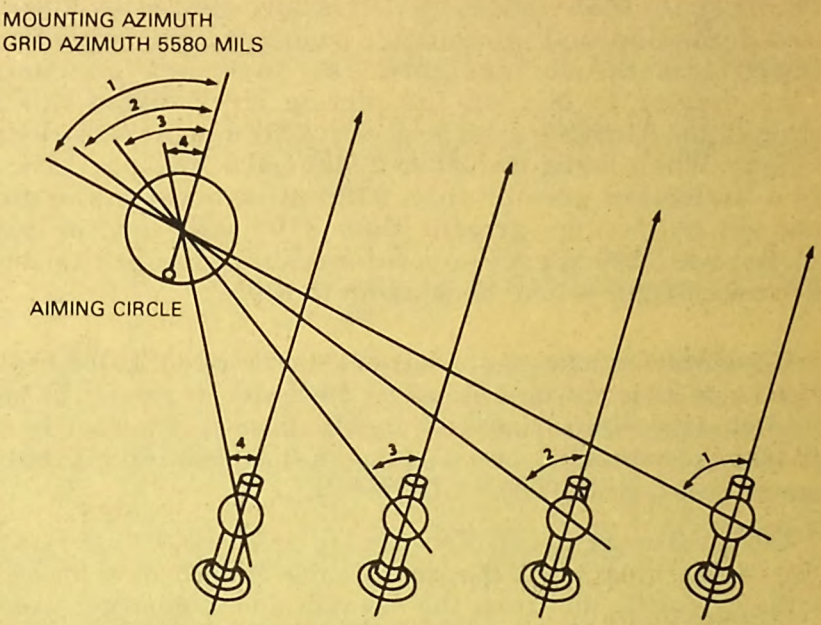

Figure 2b.

NOTE: The section can be laid parallel rapidly by laying all mortars simultaneously. The instrument operator reads deflections to each mortar in turn. As soon as the gunner of any mortar announces READY FOR RECHECK, the A/C operator reads the new deflection to that mortar. By laying all mortars at the same time, the section is ready to fire in little time.

i. As soon as each mortar is laid, the A/C operator commands DEFLECTION 2800, REFER, PLACE OUT AIMING POSTS. (The aiming posts are normally placed out on a referred deflection of 2800 mils.) Each gunner, without disturbing the lay of his mortar, sets the announced deflection on his sight and alines the aiming posts with the vertical line of the mortar sight. He then announces UP.

j. When all gunners announce UP, the A/C operator covers the head of the aiming circle, but leaves the instrument in position to permit a rapid recheck of any mortar if necessary.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 1, pages 33 and 65, para 37 and 83)
FM 23-92, 4.2-in Mortar, M30, Jun 70 (chap 1, page 37, para 36)

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TASK NUMBER: 071-321-4001

BORESIGHT MORTAR FOR DEFLECTION USING THE M2 AIMING CIRCLE

CONDITIONS:

Given an M2 aiming circle, a mounted mortar complete with sight, and personnel to act as gunner.

STANDARDS:

Boresight the mortar for deflection to a 1-mil accuracy within 5 minutes.

PERFORMANCE MEASURES:

1. Calibration for deflection, using aiming circle (angle method) when boresight is not available.

a. Set up the aiming circle 25 meters to the rear of the mounted mortar (800 mils elevation).

b. With the azimuth scale and micrometer of the aiming circle at 0, aline the vertical crossline on the center of the baseplug of the mortar.

c. Traverse and crosslevel the mortar until the center axis of the barrel from the baseplug to the muzzle is alined with the vertical crossline of the aiming circle telescope reticle (figure 1).

d. Turn the deflection knob of the sight until the vertical line is centered on the lens of the aiming circle and read Angle A, opposite the fixed index (figure 2).

e. Turn the azimuth micrometer knob of the aiming circle until the vertical crossline of the telescope is laid on the center of the sight lens and read Angle B (figure 2) opposite the azimuth scale index. If the sight is in calibration, angles will be equal. If they are not equal, the sight is adjusted as follows: Loosen the two boresight locking screws on the deflection knob and slip the micrometer deflection scale until the arrow on the index is alined with the deflection reading of the aiming circle.

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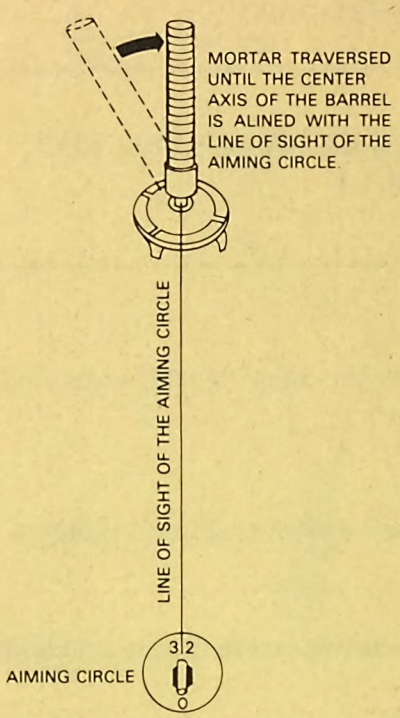
MORTAR TRAVERSED UNTIL THE CENTER AXIS OF THE BARREL IS ALINED WITH THE LINE OF SIGHT OF THE AIMING CIRCLE.
LINE OF SIGHT OF THE AIMING CIRCLE
AIMING CIRCLE
3
2

Figure 1. Alining mortar barrel with vertical line of aiming circle telescope reticle.

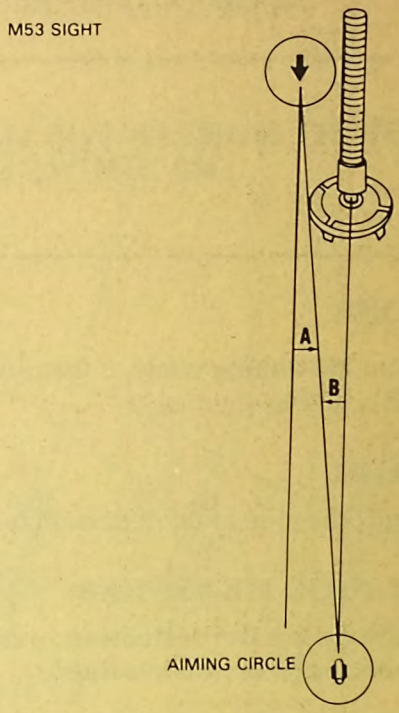

Figure 2. Determining angle A

2. Calibration for deflection, distant aiming point method, using the aiming circle when boresight is not available.

a. Set up the aiming circle and aline the vertical crossline on a distant aiming point (a sharp, distinct object not less than 200 meters distant).

b. Mount the mortar on level ground approximately 25 meters from the aiming circle and on the line between the aiming circle and the distant aiming point. Center the traversing bearing and crosslevel.

c. With the vertical line of the aiming circle still laid on the distant aiming point, move the mortar baseplate until the center of the baseplug is alined with the vertical line of the aiming circle. Traverse and crosslevel until the axis of the barrel, from baseplug to muzzle, is alined with the vertical line of the aiming circle.

d. Lay the vertical line of the sight unit on the same distant aiming point. If the sight is calibrated, the deflection reading will be 3200. If it does not read 3200, loosen screws in base of micrometer knob and slip scale to zero and tighten screws.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Jan 72 (page 29, para 34 and 35)

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TASK NUMBER: 071-321-4009

LAY MORTAR FOR DIRECTION USING M2 COMPASS (GROUND-MOUNTED)

CONDITIONS:

Given an M2 compass, a prescribed azimuth, squad members, ground-mounted mortar complete with sight, aiming post, and baseplate stake.

STANDARDS:

Baseplate stake will be positioned where mortar is to be mounted and directional stakes will be alined to within 10 mils of the prescribed mounting azimuth.

PERFORMANCE MEASURES:

Reciprocal laying using the M2 compass. A fast way to lay the section parallel is to use the compass. Use it only when an aiming circle is not available or when time dictates. It is not as accurate as the other methods.

1. Before mounting the mortars, each squad leader puts a base stake in the ground to mark the location of his mortar.

2. The section leader announces the desired mounting azimuth as MOUNT MORTARS, AZIMUTH 2200.

3. Each squad leader places his compass on the base stake marking the location of his mortar and orients the compass on the mounting azimuth. By sighting through the compass, he directs the second ammunition handler in alining the aiming posts along the mounting (magnetic) azimuth.

4. Each mortar is then mounted and laid on the aiming posts with a deflection of 3200 (zero on the M34A2 sight) set on the M53 sight. If no mechanical or human error exists, the mortars are now laid parallel. However, both types of error can easily occur.

NOTE: As there are differences in compasses, the section sergeant may direct that all mortars be laid with one compass. This avoids some error. It is also possible to lay the base mortar only as described above and then lay the other mortars parallel using the mortar sight method. In any event, use the compass method only when the aiming circle or mortar sight method is not feasible.

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 2, page 70, para 83g)
FM 23-92, 4.2-in Mortar, M30, Jun 70 (chap 2, page 70, para 72g)

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TASK NUMBER: 071-321-4050

ENGAGE A TARGET USING FIRE WITHOUT AN FDC (DIRECT LAY AND DIRECT ALINEMENT)

CONDITIONS:

Situation 1: Acting as the gunner, given a mounted 81-mm mortar (baseplate settled), HE ammunition, firing table, a target observable from the mortar positions, and an assistant gunner, ammo bearer, and squad leader.

Situation 2: Acting as the gunner, given a mounted 81-mm mortar (baseplate settled) laid on a directional stake, HE ammunition, firing table, a defilade mortar position from which target cannot be seen, an assistant gunner, ammo bearer, and FO/squad leader.

STANDARDS:

Situation 1: Direct lay method: Gunner, within 4 minutes, will engage a point type target at a range of 500 to 1000 meters using no more than 4 rounds IAW performance measures below.

Situation 2: Direct alinement method: Gunner, within 7 minutes, will engage an area target at a range of 1000 to 2000 meters using no more than 5 rounds IAW performance measures below.

PERFORMANCE MEASURES:

1. **Direct Lay Method:**

a. During engagement of a target using direct lay, the responsibility for placing effective fire on the target rests primarily with the gunner.

NOTE: Direct lay should be used only in emergencies, when destruction of the target is more important than the safety of the mortar crew.

b. The squad leader will give the gunner the initial charge and elevation to fire the first round.

c. The gunner, after placing the elevation on the sight and making sure that the correct deflection is on the sight (M53, 3200 deflection; M34A2, 0 deflection), will lay the vertical crossline on the target (the target is the aiming point) (figure 1).

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d. As soon as the mortar is laid on the target, the gunner will have the ammo bearer (who has placed the correct charge on the round) fire the round.

e. When the round impacts, one of two things has happened:

(1) A target hit: If the first round is a target hit, the mortar crew would immediately go into the FIRE FOR EFFECT.

(2) A target miss: If the first round is a miss, the gunner would start adjusting onto the target using the **BURST ON TARGET** method of adjustment (figure 2).

f. If he has a miss, the gunner knows that the cannon and the sight are not alined. By using burst on target, the gunner alines the sight with the cannon:

(1) Using the deflection micrometer knob, the gunner turns the sight (cannon must not move) towards the burst until the vertical crossline splits the point of burst (figure 3).

(2) The gunner will then shift the mortar using the traversing handwheel until the vertical crossline is again alined on the target (figure 4).

(3) The second round should be a target hit. If it is not, (1) and (2) above would be repeated.

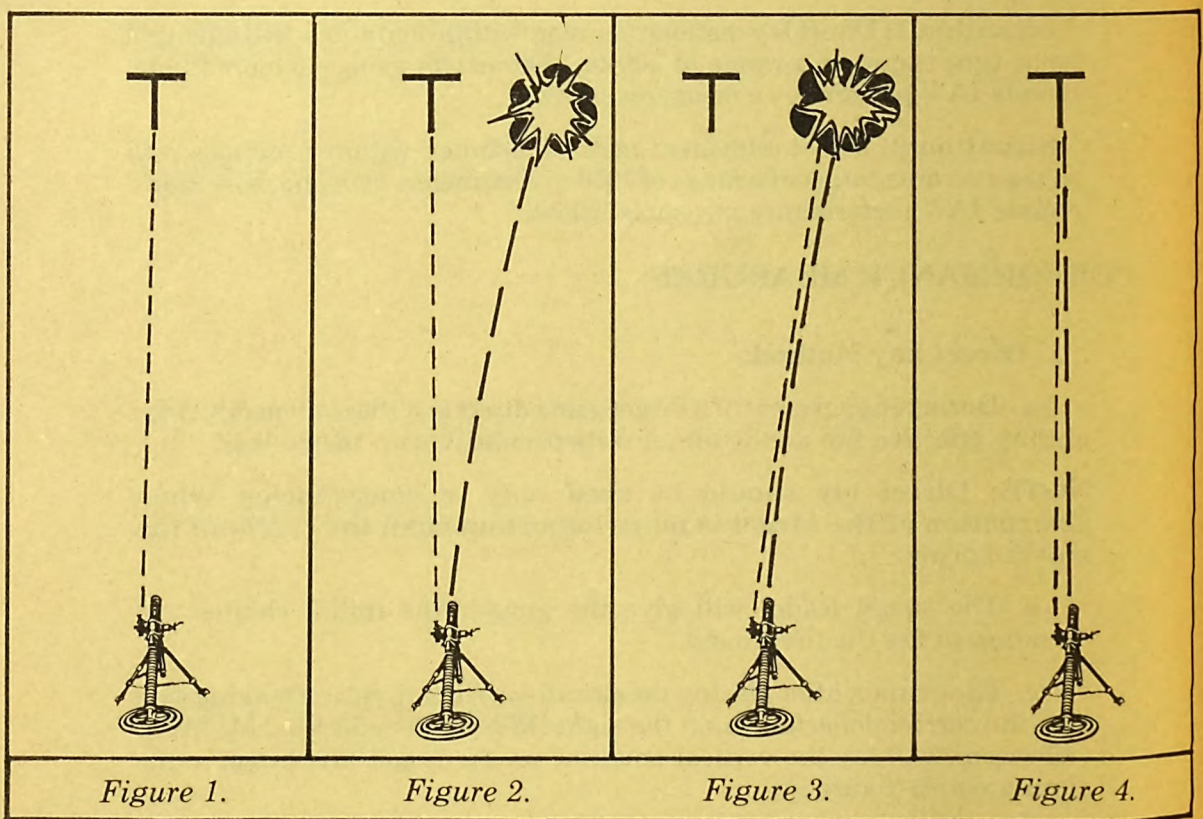

Figure 1. *Figure 2.* *Figure 3.* *Figure 4.*

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g. Range corrections will be made using turns of the elevating crank. (Example: if round is over, **UP 4** turns or **UP 8** turns. If round is short, **DOWN 4** turns or **DOWN 8** turns. When the gunner has a round over and one short of the target, he then knows the range it will take to hit the target.)

2. **Direct Alinement Method.**

a. During engagement of a target using direct alinement, the responsibility for placing effective fire on the target rests primarily with the squad leader who acts as the forward observer (FO) for the mortar.

b. The FO/squad leader will send fire commands to the gunner. These commands will differ from the correction an FO would send in that he will send correction in mils or turns for deflection, and for range he will send turns, range, or charge and elevation.

Example: "RIGHT/LEFT 50" or "RIGHT/LEFT 5 TURNS"; "RANGE 1200," or "RANGE 1250"; or "CHARGE 2, ELEVATION 1096" or "UP/DOWN 8 TURNS."

c. When the gunner receives a command in turns, he simply makes the number of turns requrested, levels up and fires. However, when the gunner receives a correction in mils he must determine the new deflection to place on the sight. To do this the gunner uses the **LARS** rule **(LEFT ADD, RIGHT SUBTRACT).**

Example:

Deflection on Sight	Correction	New Deflection
4210	RIGHT 40	4170
3780	LEFT 50	3830

d. For range corrections the FO/squad leader has the option of sending corrections as a charge and elevation or range.

Example: "CHARGE 2, ELEVATION 1096" or "RANGE 1250."

If the FO/squad leader sends range, the gunner must have a firing table from which he will determine the correct charge to place on the round and the elevation for the sight.

e. Other than the changes discussed, the gunner's job is the same in direct alinement as in a normal mission using the indirect fire team (mortar crews, FOs, FDC).

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 96, para 111-134)

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TASK NUMBER: 071-321-4051

ADJUST FIRE, WITHOUT AN FDC, USING DIRECT ALINEMENT

CONDITIONS:

As a mortar squad leader acting as the forward observer for the mortar in a field environment, without an FDC, given mortar complete with crew, binoculars, compass, identifiable target, and designated OP position. (The OP position can be **either** within 100 meters of the mortar position **or** within 100 meters of the gun-target (GT) line.)

STANDARDS:

Within 10 minutes, the observer must achieve effect on target within 5 adjustments. The round must land within 50 meters of an area target or 25 meters of a point target to achieve effect on a target.

PERFORMANCE MEASURES:

1. **General.** Under certain conditions (communications failure, lack of equipment, etc.), it may be impossible to use an FDC. In fire without an FDC, the FO makes corrections differently than when operating with an FDC. He makes all his deviation corrections with respect to the GT line rather than with respect to the observer-target (OT) line. All deviation corrections are sent in mils or turns of the traversing handwheel.

2. **Forward observer within 100 meters of the mortar position.** The best location for the FO for rapid fire adjustment is at the mortar position where his deviation spotting and deflection corrections (in mils) to be put on the sight are the same. Normally, however, the FO will be in a position other than at the mortar; but if he is within 100 meters of the gun, the deviation error that he reads in his binoculars can be applied directly to the sight without computation. For example, if the FO, from a position within 100 meters of the mortar, observes the burst to the left of the target and reads that it is 40 mils left on the mil scale of his binoculars, he orders a correction of RIGHT FOUR ZERO. This correction is sent to the mortar in mils, and is not converted to meters. The gunner applies this correction directly to the previous deflection setting using the LARS (left add, right subtract) rule.

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3. **Forward observer more than 100 meters from the mortar position.** When the FO cannot be within 100 meters of the mortar, he must locate himself within 100 meters of the GT line. This might present some difficulty in visualizing the GT line and getting within 100 meters of it. If the FO is attacking targets over a wide frontage, he would have to move frequently. In this case, the angle between the gun-burst and the GT line is not equal to the angle between observer-burst and the GT line. Computation must be made to correct the differences in these angles. For example, if the FO is halfway between the mortar and the target, the correction to make on the sight is half his deviation spotting; if the mortar is halfway between the FO and the target, the correction is twice his deviation spotting. As other distances give other ratios, it is necessary to apply a correction factor to the number of mils spotted before ordering a deflection change. This factor is a fraction, the numerator of which is the OT distance, and the denominator of which is the GT distance.

For example, if the distance from the FO to the target is 1,000 meters and the GT distance is 1,200 meters, and the deviation of the burst from the target as read by the FO is 60 mils (figure 1), the correction is:

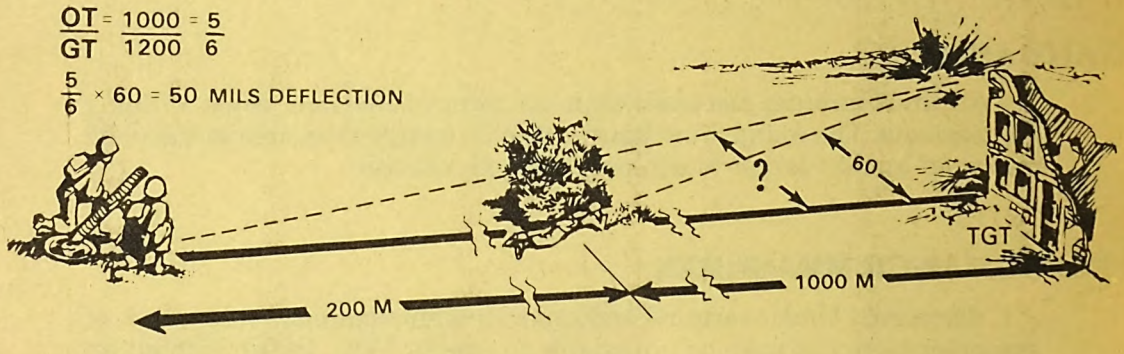

Figure 1. Observer more than 100 meters from mortar but within 100 meters of gun-target line.

4. **Adjust for range.** To adjust for range use the bracketing method of adjustment or turns may also be used to adjust for range. (Example: round lands over target — search up 8 turns; next round lands short — search down 4 turns to bracket target and continue splitting bracket until target is hit.)

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 6, page 96-99, para 113-118)
FM 23-92, 4.2-in Mortar, M30, Jun 70 (chap 6, page 118-120, para 137 and 138)

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TASK NUMBER: 071-321-4052

LAY MORTAR FOR DIRECTION USING DIRECT ALINEMENT METHOD (FIRE WITHOUT FDC)

CONDITIONS:

As a mortar squad leader, given a mounted mortar in a defilade position, the mortar complete with sight and an aiming post or stake with cross-arm (T-bar), an observable target, and a gun crew.

STANDARDS:

Within 5 minutes, aline the mortar and the aiming post or stake with the target.

PERFORMANCE MEASURES:

Direct alinement procedure. Figure 1. To find the direction in which to lay the mortar, the squad leader first picks the area where the mortar will be mounted, keeping in mind that it must be in defilade. In alining the mortar on the target, the squad leader can use an aiming post, but the most accurate method is to use some sort of aiming stake with a cross-arm on it. To do this the squad leader moves to a point where he can see the target and also see the mortar. He then positions the stake with the cross-arm pointed at the target; without disturbing the stake he reverses his position so as to sight back along the cross-arm and directs the positioning of the mortar. The gunner sees that a 3200 (0-M34A2) deflection is set on the sight and vertical crossline is on this aiming stake. The mortar is now alined and ready to be fired. When registration or adjustment has been completed, aiming posts can be placed out on a referred deflection as in normal procedure. All fire commands and subsequent corrections from the squad leader/FO are sent to the gunner and set on the sight.

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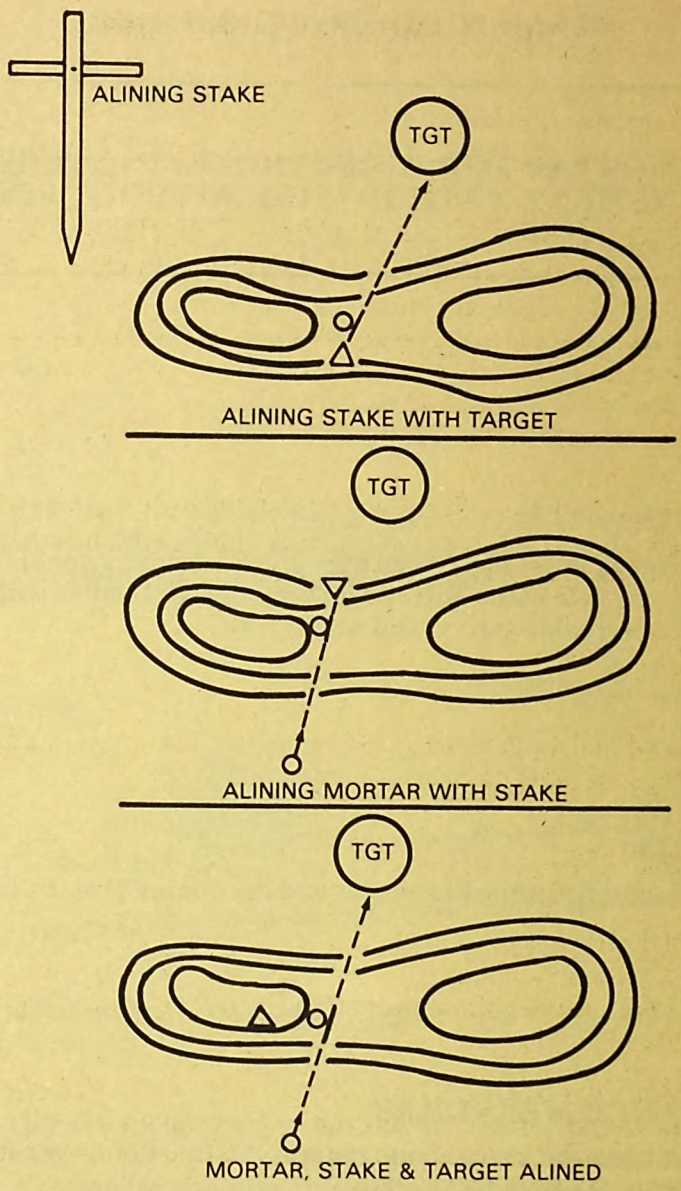

Figure 1.

NOTE: Two narrow pieces of wood from an ammo box nailed together to form a cross will serve as the aiming stake (T-bar).

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (page 96, para 113, 114)
FM 23-92, 4.2-in Mortar, M30, Jun 70 (page 117, para 136)

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TASK NUMBER: 071-321-4053

FIRE A LADDER MISSION USING FIRE WITHOUT AN FDC (DIRECT ALINEMENT)

CONDITIONS:

Acting as the squad leader, given a mounted 81-mm mortar complete, in a defilade position, mortar crew, a direction stake with mortar laid on it, an FO position with observable targets, and a firing table.

STANDARDS:

Target will be taken under effective fire within 5 minutes IAW the performance measures below.

PERFORMANCE MEASURES:

The LADDER method of adjustment, which is a modification of the bracketing method, reduces adjustment time and permits FIRE FOR EFFECT to be delivered more rapidly. The procedure for firing the ladder adjustment is as follows:

1. ESTIMATE THE MORTAR-TARGET RANGE. The mortar is either alined on the target, or the squad leader/FO measures the deviation of the target from the RP or other known point (amount of shift). He then estimates the gun-target (GT) range.

2. DETERMINE SIZE OF LADDER. Using the minimum range change guide, he determines the size ladder he will fire:

0-999 meters -- 100m Ladder
1000-1999 meters -- 200m Ladder
2000-to max range -- 400m Ladder

The object is to have one of the three rounds to impact beyond the target and one to fall short (figure 1).

NOTE: Once the target is between the far round and the near round, the squad leader/FO knows the exact range to the target (figure 1).

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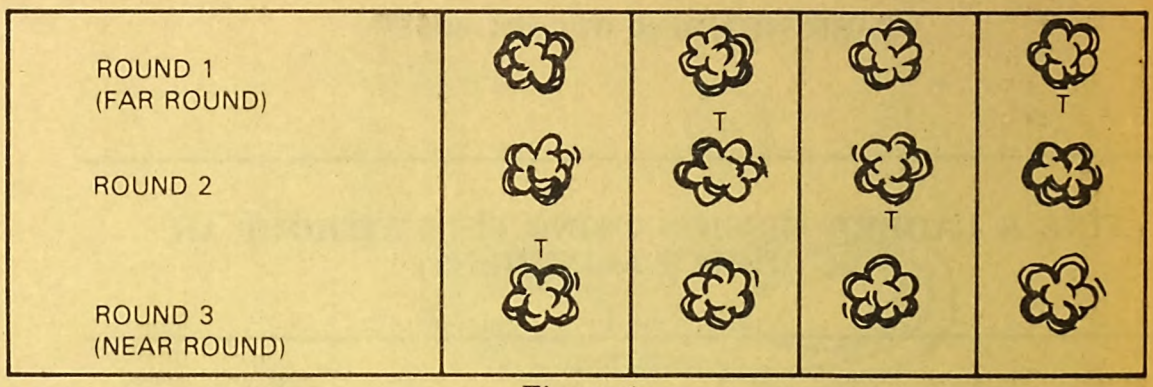

Figure 1.

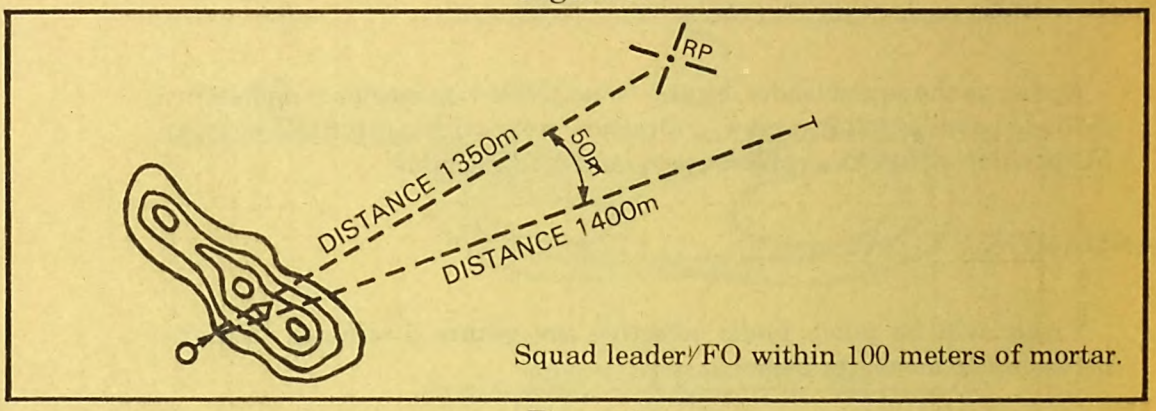

Figure 2.

Using the example in figure 2, where the GT range is 1400 meters, the squad leader/FO would shoot a 200-meter LADDER.

3. DETERMINE MIL LENGTH OF LADDER.

a. The squad leader/FO must now determine the number of mils of elevation it will take to move the barrel from the elevation to fire the far round to the elevation to fire the near round (figure 3).

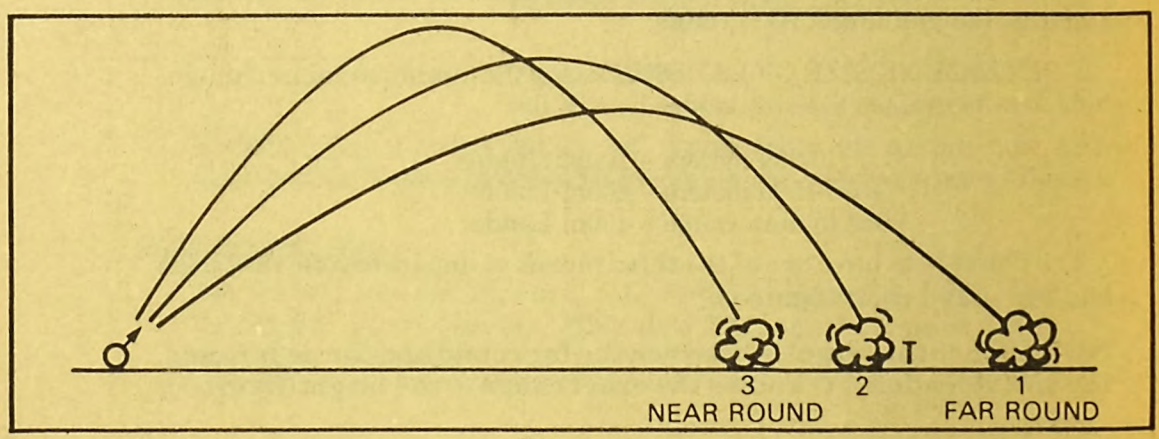

Figure 3.

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b. To determine this mil length of the target, he uses the firing table (figure 4). The squad leader/FO has determined that the range to the target is 1400 meters; thus, he is going to fire a 200-meter ladder. The first round is going to be fired at a range of 1500 meters; round 2 at 1400 meters; and round 3 at 1300 meters. He goes to the firing table and finds this information:

RANGE	ELEVATION
1300 meters	1063
1400 meters	984
1500 meters	839

He then subtracts the elevation for the far round from that for the near round:

Near round -- 1300 meters	1063 mils
Far round -- 1500 meters	839 mils
Length of ladder in mils	224 mils

CARTRIDGE, HE, M374A2
FUZE, PD, M524A6

FT 81-AJ-2
(ABRIDGED)

RANGE M	ELEV MILS	MAX ORD M	CHG	ELEV MILS	MAX ORD M	CHG
75	1504	202	0			
100	1472	200	0			
125	1438	198	0			
150	1405	196	0			
175	1370	193	0			
200	1334	190	0	1501	533	1
225	1296	186	0	1489	531	1
250	1256	181	0	1476	530	1
275	1214	176	0	1464	528	1
300	1168	169	0	1451	526	1
325	1116	161	0	1438	524	1
350	1056	151	0	1425	522	1
375	980	137	0	1412	520	1
400	824	107	0	1398	517	1
425				1385	514	1
450				1371	511	1
475				1357	508	1
500	1428	771	2	1343	504	1
525	1419	769	2	1329	501	1
550	1410	767	2	1315	497	1
575	1401	764	2	1300	493	1
600	1392	761	2	1285	488	1
625	1382	758	2	1269	483	1
650	1373	755	2	1253	478	1
675	1363	752	2	1237	473	1
700	1354	748	2	1220	467	1
725	1344	745	2	1203	461	1
750	1334	741	2	1185	454	1
775	1324	737	2	1167	447	1
800	1314	733	2	1148	439	1
825	1304	729	2	1128	431	1
850	1294	725	2	1106	422	1
875	1283	720	2	1084	412	1
900	1273	715	2	1059	401	1
925	1262	710	2	1033	389	1
950	1251	705	2	1003	375	1
975	1240	699	2	969	358	1
1000	1228	693	2	928	338	1

RANGE M	ELEV MILS	MAX ORD M	CHG	ELEV MILS	MAX ORD M	CHG
1000	1228	693	2	928	338	1
1025	1217	687	2	867	307	1
1050	1205	681	2			
1075	1192	674	2			
1100	1180	667	2	1301	975	3
1125	1167	660	2	1293	970	3
1150	1154	652	2	1285	965	3
1175	1140	644	2	1277	961	3
1200	1126	636	2	1268	955	3
1225	1111	627	2	1260	950	3
1250	1096	617	2	1252	945	3
1275	1080	607	2	1243	939	3
1300	1063	596	2	1235	934	3
1325	1046	584	2	1226	928	3
1350	1027	571	2	1217	921	3
1375	1006	556	2	1208	915	3
1400	984	541	2	1199	908	3
1425	959	522	2	1190	902	3
1450	930	501	2	1180	894	3
1475	894	474	2	1170	887	3
1500	839	433	2	1160	879	3
1525				1150	871	3
1550				1140	863	3
1575				1129	854	3
1600	1237	1174	4	1118	845	3
1625	1230	1168	4	1107	836	3
1650	1223	1162	4	1095	826	3
1675	1216	1156	4	1083	816	3
1700	1208	1149	4	1070	805	3
1725	1201	1143	4	1057	793	3
1750	1194	1136	4	1044	781	3
1775	1186	1129	4	1029	768	3
1800	1178	1121	4	1014	754	3
1825	1170	1114	4	998	739	3
1850	1162	1106	4	981	722	3
1875	1154	1098	4	962	704	3
1900	1146	1090	4	941	683	3

Figure 4.

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4. DETERMINE LENGTH OF LADDER IN TURNS.

a. To determine turns, the mil length, 224 mils, is divided by the number of mils in one turn of the elevation crank (10 mils).

$$224 \div 10 = 22.4 \text{ or } 22\frac{1}{2} \text{ TURNS}$$

b. Turns will always be rounded to the nearest ½ turn.

5. DETERMINE TURNS BETWEEN ROUNDS.

a. Remember, a ladder is always three rounds.

b. The number of turns is divided by the number of intervals between rounds — for example: 10 rounds, 9 intervals; 7 rounds, 6 intervals; 3 rounds, 2 intervals, etc. In the example, there are 22½ turns and 3 rounds:

$$22.5 \div 2 = 11.2 \text{ or } 11 \text{ TURNS}$$

c. For this mission, the gunner will elevate 11 turns between rounds.

6. THE FIRE COMMAND.

a. SQUAD.

b. HE QUICK.

c. LADDER, SEARCH UP ELEVEN TURNS.

d. FROM RP, RIGHT 50.

e. CHARGE 2.

f. ELEVATION 839.

NOTE: The squad leader/FO has the option of sending the range to the target or charge and elevation; if range is sent, the gunner determines the charge and elevation for the range sent.

These rounds would be fired as fast as safety will permit.

7. FIRE FOR EFFECT.

a. As soon as the rounds land, the squad leader/FO must determine where the target is located in relation to the three rounds (figure 5).

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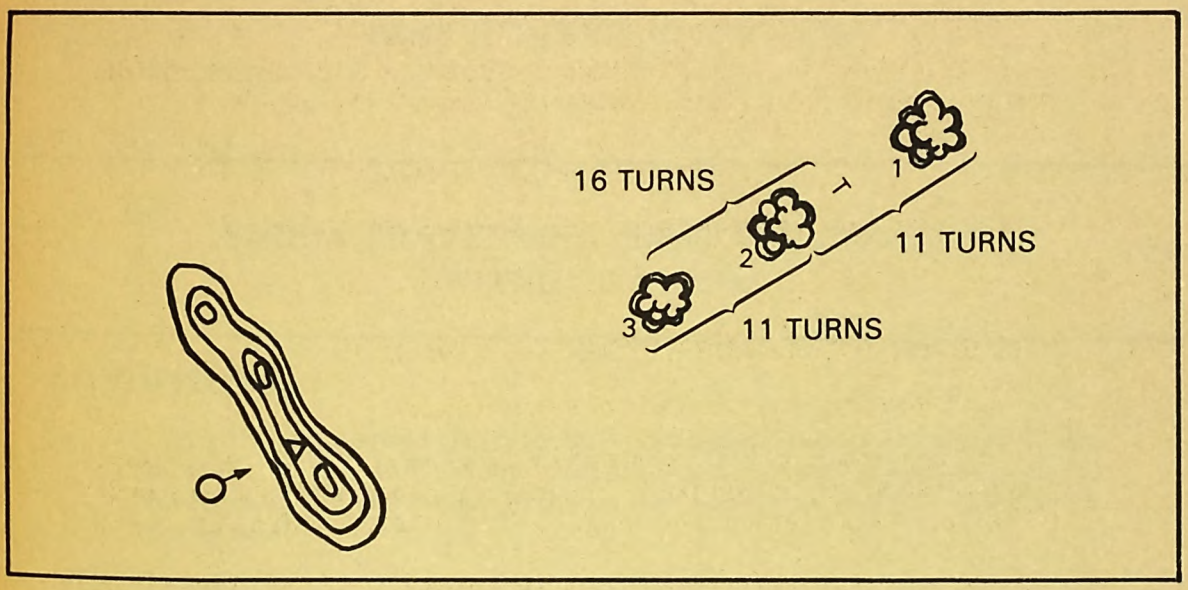

Figure 5.

b. In figure 5, the target appears between round 1 and round 2. After firing the 3d round, the gunner has left the mortar as it was when fired (up 22 turns). The squad leader/FO knows that if he goes down 11 turns, he could hit where round 2 hit; the target is halfway between number 2 and number 1 round. If he goes down 5 more turns, he will be right on target and be ready to FIRE FOR EFFECT.

c. The subsequent command to the gunner would be:

(1) 5 rounds.

(2) Down 16 turns.

The gunner will lower the barrel 16 turns, then level the elevation bubble on the sight by using the elevation micrometer knob. This will allow the gunner to keep the mortar level during the FIRE FOR EFFECT.

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 6, page 96-104, para 111-129)

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TASK NUMBER: 071-321-4054

FIRE A TRAVERSING MISSION USING FIRE WITHOUT AN FDC

CONDITIONS:

Acting as the squad leader for an 81-mm mortar, given a mounted 81-mm mortar complete and laid for direct alinement in a defilade position, an FO position within 100 meters of the mortar, with observerable targets and a firing table.

STANDARDS:

Within 5 minutes place effective fire on a wide target using traversing fire.

PERFORMANCE MEASURES:

Traversing fire covers targets extending in width that cannot be effectively covered with a fixed fire for effect but can be covered with a distributed fire for effect (mortar is manipulated between rounds). As with a search mission the traverse mission is a two-part mission, adjustment and fire for effect (distributed).

1. **Adjustment on target.**

a. The squad leader/FO must adjust on one end of the target using the bracketing method. There are a few factors he will consider in picking this point.

(1) Direction of the wind (rounds should walk into the wind so that smoke and dust will not interfere with observation of next round) (figure 1).

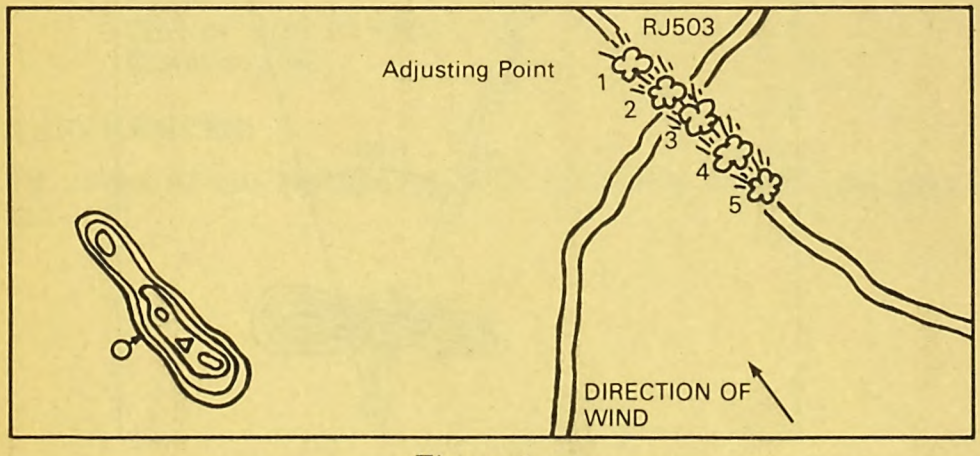

Figure 1.

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(2) If wind is not a factor, he will adjust on the end nearest a known point (RP or previously fired target for which the gunner has data) using the shift method of target location.

b. The squad leader/FO will adjust until he splits a 50-meter bracket.

2. **Fire for effect on target.**

a. After adjustment the squad leader/FO must determine the mil width of the target by--

(1) Mil scale in the binoculars.

(2) Finger/hand mil method.

(3) Reading an azimuth to each end and subtracting the smaller from the larger.

b. He divides the mil width of the target by 10 (mils per turn of the traversing handwheel) to determine the total turn across the target.

$$
\begin{array}{r}
12 \\
10\overline{)120} \\
\underline{10} \\
20 \\
\underline{20} \\
0
\end{array}
$$

The squad leader/FO now knows that it will take 12 turns of the traversing handwheel to cover the target (figure 2).

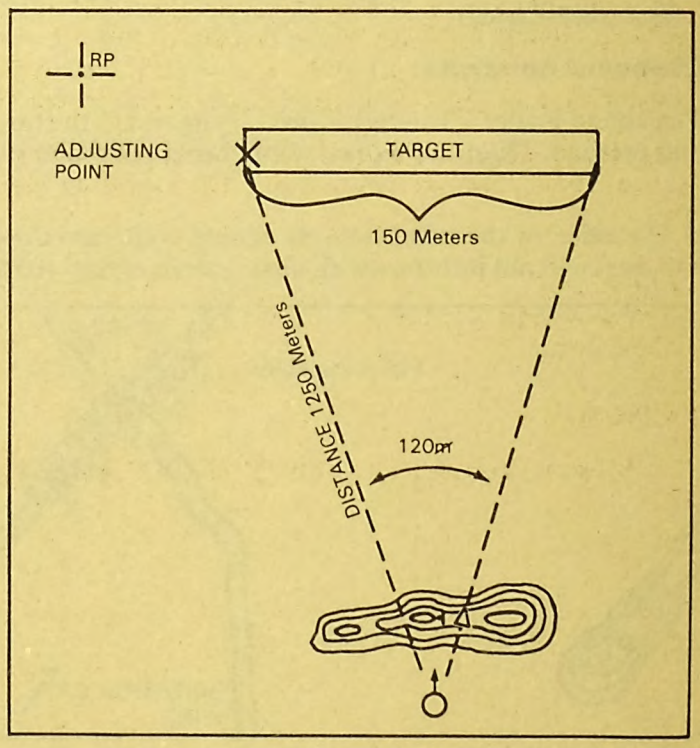

Figure 2.

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c. The next step is to determine how many rounds it will take to place effective fire on the target. He knows that he should use 5 rounds per 100 meters of target width or 1 round for each 20 meters of target. In the example the target is 150 meters wide, and 7 rounds will cover 140 meters, but he would still have 10 meters left over. When this happens, the FO/squad leader has a choice based on ammo on hand and resupply of ammo. He could fire just 7 rounds and hope he covers that extra 10 meters, or he can fire 8 rounds to cover that 10 meters. For this mission he will use 8 rounds.

d. The last step prior to giving the subsequent command is to determine the turns between rounds. To do this he will divide the number of turns (12 turns) by the number of intervals between rounds (8 rounds = 7 intervals).

NOTE: There is always one less interval than the number of rounds to be fired.

$$
\begin{array}{r}
1.7 \\
7\overline{)12.0} \\
\underline{7} \\
50 \\
\underline{49}
\end{array}
\qquad 1.7 = 1\tfrac{1}{2} \text{ turns}
$$

The gunner will traverse 1½ turns between rounds.

NOTE: After adjustment and prior to issuing the subsequent fire command, the squad leader/FO must tell the gunner to prepare to traverse right or left.

e. In the example the gunner will be given the command "PREPARE TO TRAVERSE RIGHT." At this command the gunner would traverse the mortar all the way to the left, back off two turns, shift the mortar, and re-lay on the directional stake. He will then wait for future instructions.

f. The mortar is set and the squad leader/FO has determined the data to place fire on the target. He would give the following subsequent fire command:

8 rounds
Traverse right 1½ turns
Elevation 1096

REFERENCES:

FM 23-90, 81-mm Mortar, C1, Feb 72 (chap 6, page 96-104, para 111-129)

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TASK NUMBER: 071-321-4055

ENGAGE A DEEP TARGET USING SEARCHING FIRE WITHOUT AN FDC

CONDITIONS:

Acting as the squad leader, given a mounted 81-mm mortar complete, in a defilade position, mortar crew, a direction stake with mortar laid on it, an FO position with observable targets, and a firing table.

STANDARDS:

Target will be taken under effective fire within 5 minutes, IAW the performance measures below.

PERFORMANCE MEASURES:

Searching fire is used to place effective fire on targets extending in depth and is a two-part mission: adjustment and engagement.

1. **Adjustment on Target.**

a. The first step is that the squad leader/FO must adjust on one end of the target, normally the far end, and walk the round in towards the near end (this would allow him to see each round as it impacts without smoke or dust from preceding rounds interfering).

b. The adjustment will be made using the bracketing method.

c. The squad leader/FO will split a 50-meter bracket in the adjustment.

2. **Engagement of Target.**

a. After adjustment is completed, the squad leader/FO will know the range to one end of the target (normally far end). He then estimates the range to the other end.

b. He now determines how long the target is in mils:

(1) Before beginning the mission, using the firing table, he picks a charge that can be used to fire on the near end as well as the far end of the target.

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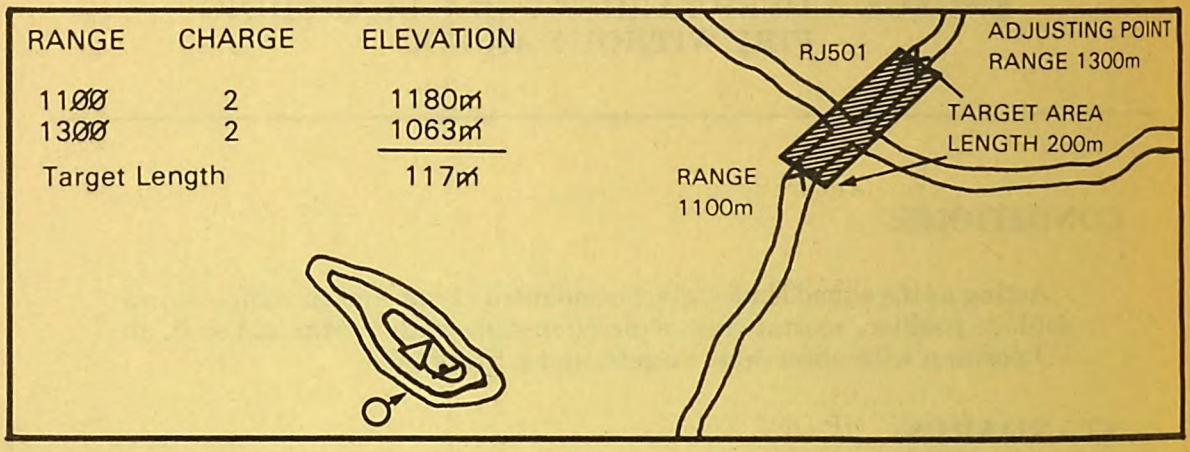
(2) He then determines the elevation for each range (near end and far end).

(3) By subtracting the smaller elevation from the larger elevation, he can determine the target length in mils.



c. To determine how many "turns" the target is long, he divides the mil length (117m) by 10 (number of mils per turn of elevating crank).

$$10\overline{)117.0} = 11.7$$

$$10 \quad 17 \quad 10 \quad 70$$

11.7 = 11.5 = 11½ turns.

NOTE: Turns are always rounded to nearest half turn.

d. The squad leader/FO must next determine the number of rounds to fire on the target and the number of intervals between rounds.

NOTE: The rule is 5 rounds per 100 meters of width or depth, e.g., 100m = 5 rds, 200m = 10 rds, 300m = 15 rds. If there is a shortage of ammo, this can be modified; however, you will not get good target coverage.

(1) Since the target is 200-meters long, the squad leader/FO will use 10 rounds to cover the target.

(2) By using 10 rounds, there will be 9 intervals.

NOTE: There will always be one less interval than the number of rounds being fired.

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e. The next step prior to firing for effect is to determine the number of turns the gunner will take between rounds. To do this the squad leader/FO will divide the total turns (11½) by the number of intervals (9).

$$
\begin{array}{r}
1.2 \\
9\overline{)11.5} \\
\underline{9} \\
25 \\
\underline{18} \\
7
\end{array}
\qquad 1.2 = 1 \text{ turn.}
$$

By rounding to the nearest half turn, the turns between rounds works out to 1 turn.

f. The subsequent command to the mortar crew to fire for effect would be:

10 ROUNDS
SEARCH UP ONE TURN
ELEVATION 1063

REFERENCE:

FM 23-90, 81-mm Mortar, C1, Jan 72 (chap 6, page 96-104, para 111-129)

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CHAPTER 2

INDIRECT FIRE INFANTRYMAN

SECTION IX
LEADERSHIP AND TRAINING

TASK SUMMARIES

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TASK NUMBER: 071-328-5301

INSPECT PERSONNEL/EQUIPMENT

CONDITIONS:

Given personnel or equipment to be inspected, specified amount of time, inspection site and unit SOP for inspections.

STANDARDS:

Within the time specified, inspect personnel or equipment and note deficiencies.

PERFORMANCE MEASURES:

1. **Personnel**

a. Start at the head. Check headgear, haircut, and shave.

b. Inspect collar insignia and awards.

c. Check gig line and belt buckle.

d. Check footgear.

e. Check uniform for general appearance, fit, and patches.

f. Check Identification Card (DD Form 2A) and I.D. tags.

NOTE: Before inspecting, be thoroughly familiar with unit standards.

2. **Equipment**

a. Before inspection, study applicable TM. Pay particular attention to section on preventive maintenance checks and services and the basic issue items list.

b. Begin inspection at a readily recognizable point on equipment.

c. Inspect in an orderly sequence. This saves motion and eliminates chances of missing important items.

d. Note deficiencies as you find them. Don't try to remember all of them.

e. Inspection should be complete when you return to the starting point.

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REFERENCES:

FM 22-5, Drill and Ceremonies, C1, Nov 71 (chap 7, sec III, pages 49-54)

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TASK NUMBER: 071-328-5302

SUPERVISE MAINTENANCE ON INDIVIDUAL AND TOE EQUIPMENT

CONDITIONS:

Given personnel, with equipment to be maintained, a maintenance site, and specified amount of time.

STANDARDS:

Within time specified, direct personnel assigned to your unit in the proper maintenance of individual or TOE equipment to meet Army standards as listed in applicable TM or other publications.

PERFORMANCE MEASURES:

To supervise maintenance on individual and TOE equipment:

1. Determine what is to be maintained.
2. Obtain applicable TM.
3. Brief personnel on maintenance to be performed and standards.
4. Assign tasks as stated in TM, when applicable.
5. Allocate resources if necessary.
6. Spot check (DO NOT OVER SUPERVISE).
7. Obtain assistance if needed.
8. Inspect completed work and make corrections if necessary.
9. Report completion of work to your supervisor.

NOTE: Be sure that the task is understood, supervised, and accomplished.

REFERENCES:

None

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TASK NUMBER: 071-328-5304

ENFORCE PREVENTIVE MEDICINE PROGRAM (INCLUDES PERSONAL HYGIENE)

CONDITIONS:

Your squad has been given the mission to conduct a march. As team leader, brief your men on preventive medicine measures that should be taken. A march can be tactical or administrative and can be conducted by road or cross-country, and can be conducted in daylight or darkness.

STANDARDS:

Prior to conduct of the mission, you will explain preventive medicine measures for:

1. Care of the feet prior to and during the march.

2. Purifying water with iodine tablets.

3. Disposal of human waste while on the march and during bivouac.

4. Climatological injuries, heat/cold. During conduct of the mission, inspect your subordinates to insure that they are complying with your instructions. Detect all failures to comply with your instructions and insure corrections are made.

PERFORMANCE MEASURES:

1. **Care of the Feet.**

a. Prior to the march, all men should be equipped with the proper type of correctly fitted, broken-in footgear, clean socks which are free of holes or knotty darns, and an adequate supply of foot powder. A soldier must never attempt to break in a new pair of shoes or boots on a long march. Blisters (figure 1), pressure spots, and infections should be treated and properly protected before the march starts.

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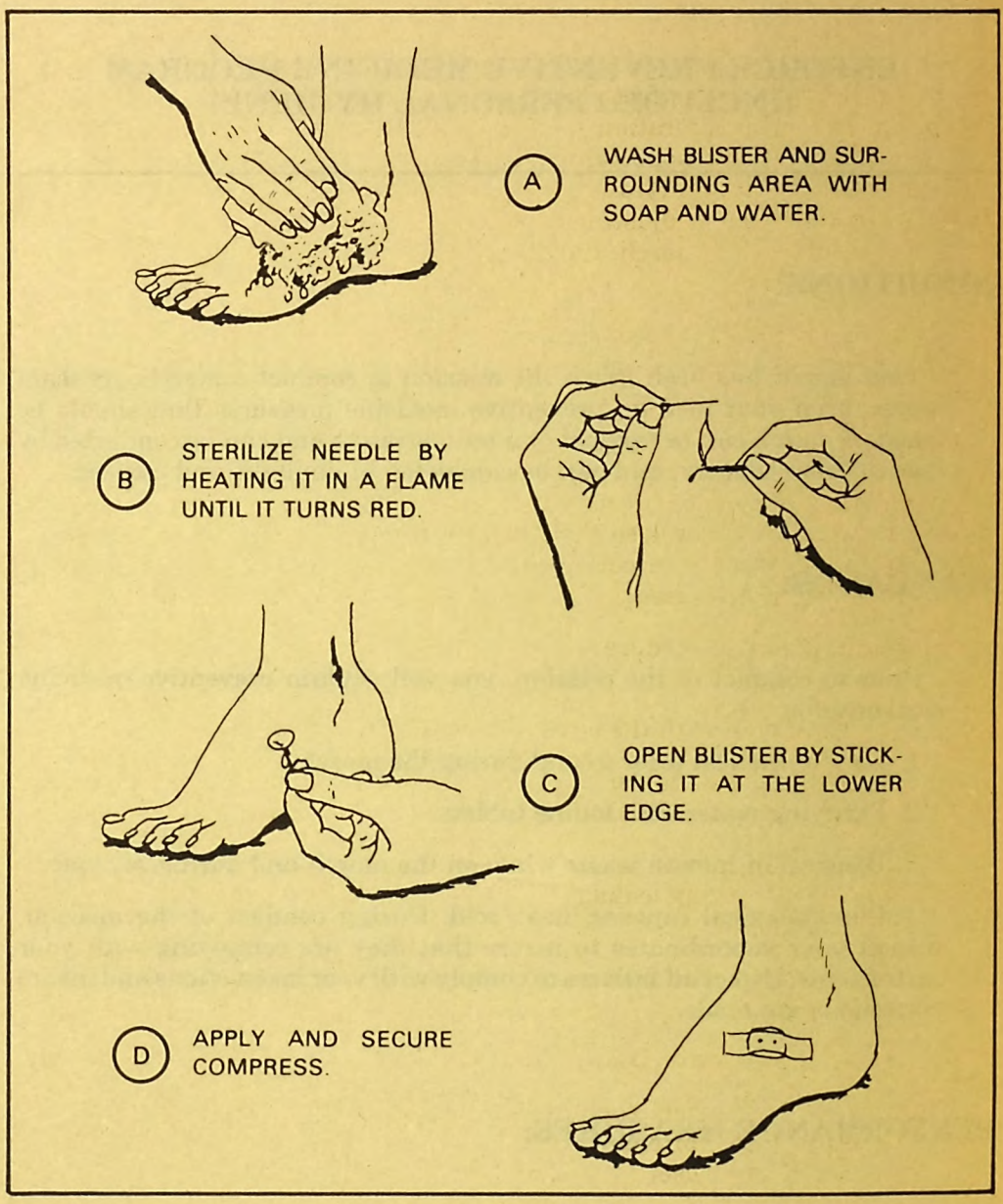
A
WASH BLISTER AND SURROUNDING AREA WITH SOAP AND WATER.
B
STERILIZE NEEDLE BY HEATING IT IN A FLAME UNTIL IT TURNS RED.
C
OPEN BLISTER BY STICKING IT AT THE LOWER EDGE.
D
APPLY AND SECURE COMPRESS.

Figure 1.

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b. On the march, the feet should be kept as dry as possible. If socks become damp from perspiration or wet from water, they should be changed to dry ones at the first opportunity. If necessary, socks may be dried by putting them under the shirt around the waist. Tender pressure spots should be relieved promptly by adjusting gear or applying adhesive tape. Once or twice daily during the march, the feet should be dusted lightly with foot powder.

c. At rest periods, the feet should be inspected (from time to time). If possible, the feet should be washed during the noon break. It is helpful to elevate the feet while resting. This reduces congestion and swelling.

2. **Purifying Water.**

a. Before iodine tablets are used, they should first be checked for physical change, as they lose their disinfecting ability in time. Tablets which are not steel gray in color, which are stuck together, or which are crumbled should not be used.

b. The following procedure is used in treating water in a canteen with iodine tablets.

(1) Fill canteen with the cleanest, clearest water available.

(2) Add one iodine tablet to a 1-quart canteen of clear water; add two tablets if the water is cloudy. Double these amounts for a 2-quart canteen.

(3) Place the cap on the canteen loosely, wait 5 minutes then shake the canteen well, allowing leakage to rinse the threads around the neck of the canteen.

(4) Tighten cap and wait an additional 20 minutes before using the water for any purpose.

3. **Human Solid Waste Disposal.**

a. When on the march, each person uses a "cat-hole" latrine during short halts. It is dug approximately 1-foot deep and is completely covered and packed down after use.

b. For overnight bivouac, the straddle trench is used (figure 2). Construction requirements are found in FM 21-10, paragraph 76.

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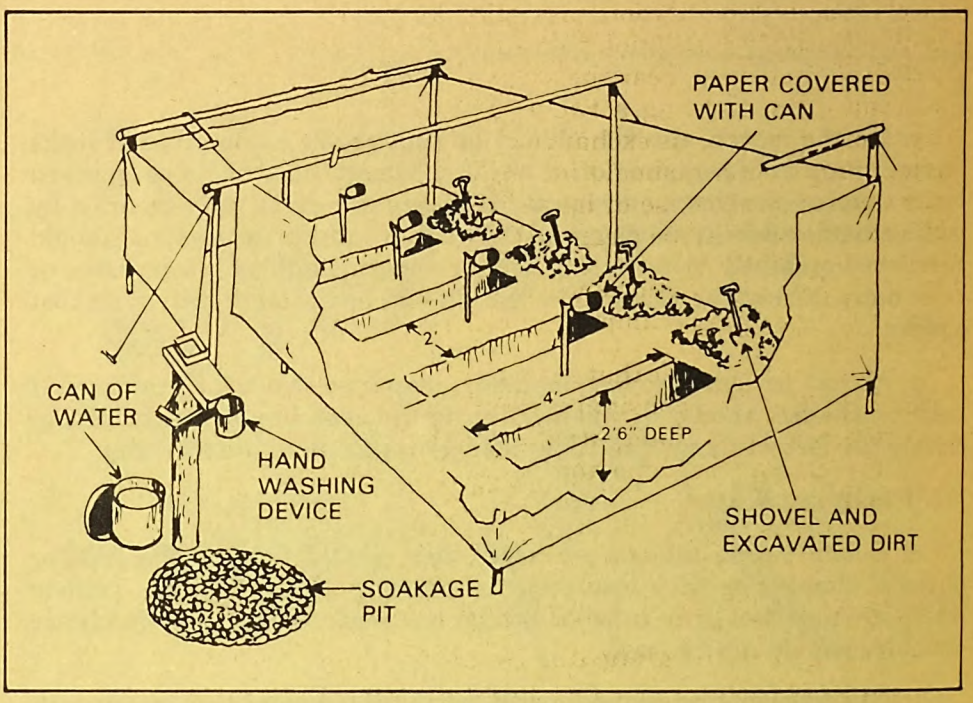

Figure 2.

4. **Climatological Injuries.**

a. Preventing heat injuries:

(1) Water requirements: The human body cannot be trained to function with less than the minimum amount of water it requires for cooling, waste elimination, and metabolism; any attempt to train the body to do so can be harmful and lead to heat injuries. Troops should be encouraged to drink water more frequently than is necessary to quench sensations of thirst.

(2) Salt requirements: When water is lost through perspiration, vital body salt is also lost. An ordinary diet contains enough salt to make up this loss when a person's water intake is less than 1 gallon a day. If daily water intake increases, the soldier should lightly salt his food from his field rations pack.

NOTE: First aid for heat injuries is found in FM 21-11.

b. Preventing cold injuries:

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(1) Clothing for cold weather is designed to afford protection, insulation, and ventilation; protection by covering as large an area of the body as possible; insulation by trapping air which has been warmed by the body and holding it near the skin to prevent loss of heat from the body; ventilation by allowing a two-way exchange of air through the various layers of clothing. This exchange of air prevents overheating and excessive perspiring. Clothing should be worn in layers and loose enough to allow movement and exercise of hands, feet, and other parts of the body. The clothing should also be clean and dry.

(2) Good circulation should be maintained by exercising the feet and legs. This is especially important during rest breaks.

(3) It is advisable that troops in cold weather be paired as "buddies," each having the responsibility for reminding the other to take warming exercises at frequent intervals and to watch for signs of frostbite and trench foot. FM 21-11 gives signs and first aid for cold-weather injuries.

REFERENCES:

FM 21-10, Field Hygiene and Sanitation, Jul 70 (chap 3, pages 14-19, 37-42, 80-86)
FM 21-11, First Aid for Soldiers, Jun 76 (chap 9, pages 88-91)
TEC Lesson 929-441-0040F, Care of Feet
TEC Lesson 929-441-0043F, Environment Hazards, Part 1: Treatment of Drinking Water
TEC Lesson 911-441-0034F, Snake Bites and Hot Weather Hazards
TEC Lesson 911-441-0035F, Cold Weather Hazards

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TASK NUMBER: 121-030-2501

PREPARE THE RATER'S SECTION OF AN ENLISTED EVALUATION REPORT (EER)

CONDITIONS:

Given DA Pamphlet 623-1, one blank DA Form 2166-5, and a No. 2 pencil.

STANDARDS:

Complete parts II and III of the Enlisted Evaluation Report, DA Form 2166-5, as outlined in DA Pam 623-1 (Preparation of Enlisted Evaluation Reports).

PERFORMANCE MEASURES:

1. Parts I and VII of the report will be completed by the Military Personnel officer (MILPO). **Parts II and III are completed by you as the rater, and by the indorser.** Part IV is completed by the indorser, and Part V is completed by the individual being rated.

NOTE: Part I should be checked by the rater and rated individual for possible discrepancies.

2. **Part II.**

A.	BRIEF DESCRIPTION OF DUTIES	Soldier performs duty as rifleman in a mechanized rifle platoon. Disperses small arms fire toward enemy when required to do so.

a. **Block A.** You will enter the actual duties performed by the rated soldier, including additional duties.

B.	INDORSER HAS NOT OBSERVED AND CANNOT RATE SOLDIER	☐

b. **Block B.** This block is not applicable to the rater. Will be completed by the indorser.

C.	REPORT BASED ON:	DAILY CONTACT	FREQ OBSN	INFREQ OBSN	REPT & REC
		R ■	☐	☐	☐
		I ☐	☐	☐	☐

c. **Block C.** Two selections are possible. Check the appropriate box to indicate frequency of contact, and, if applicable, also check reports and records. The rater will fill in the line following the "R" only.

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D. SOLDIER SUPPORTS THE ARMY'S EQUAL OPPORTUNITY PROGRAM	YES	NO
R	■	□
I	□	□

d. **Block D.** Mark the "yes" or "no" block as appropriate. A "no" response here requires explanation in Block J.

e. **Block E. Duty Performance Traits.** Rate the individual carefully on each of the ten performance traits by marking the appropriate box for each trait. Mark ratings in soft pencil, on the basis of the given rating scale. Enter the score for each trait in black ink in the score box at the right hand column under "R" and enter in the totals box at the bottom of the locations in Block H. Marking procedures are the same for Blocks F and G as in Block E, and the appropriate boxes in Block H. If the score for Block E exceeds 40 or is less than 10, justify in Block J.

E. DUTY PERFORMANCE TRAITS / RANKS WITH VERY BEST		SUPERIOR TO MOST		EXCEEDS OR MEETS DUTY REQUIREMENTS		NEEDS IMPROVEMENT		SCORE	
						Some	Much		
		5	4	3	2	1	0	R	I
1. Is well informed on all phases of assigned duties. (Scope of knowledge about duties)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
2. Carries out orders without constant supervision. (Dependability in performing without supervision)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
3. Shows interest and enthusiasm for duties. (Attitude toward duties)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
4. Demonstrates qualities of leadership. (Exerts positive influence on others)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
5. Seeks out opportunities for self-improvement. (Effort directed toward realization of potential)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
6. Displays ability to initiate action without direction from others. (Aggressive pursuit of methods to improve duty performance)	R	□	□	□	□	■	□	1	
	I	□	□	□	□	□	□		
7. Is successful in working with others. (Ability to work in harmony with others)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
8. Personal behavior sets a good example for others. (High standards of personal conduct)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
9. Takes pride in dress and appearance. (Neat and military in bearing)	R	□	□	■	□	□	□	3	
	I	□	□	□	□	□	□		
10. Is physically fit, as required, for MOS/grade during combat. (Physical condition)	R	□	■	□	□	□	□	4	
	I	□	□	□	□	□	□		
							TOTALS	29	

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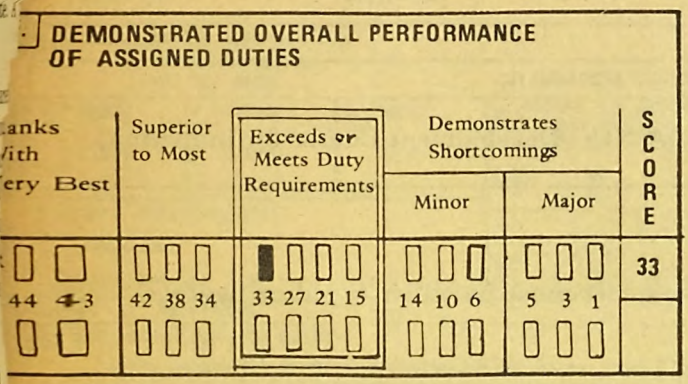
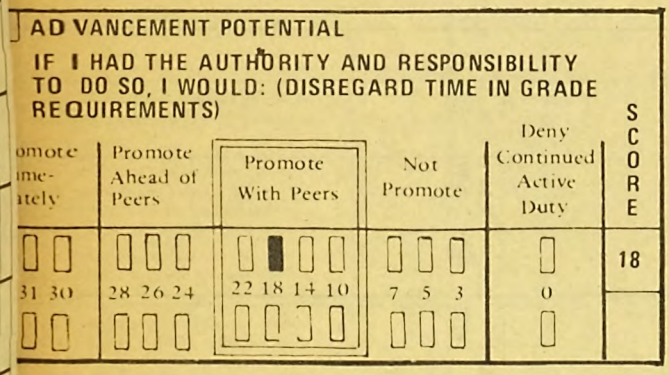
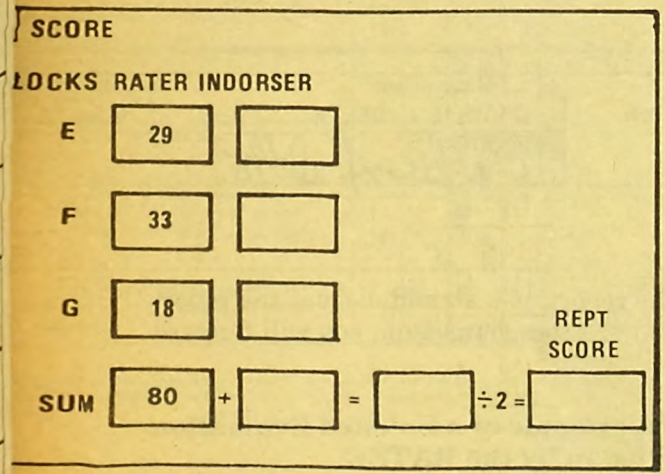
f. **Block F. Demonstrated Overall Performance of Assigned Duties.** In this section, you rate the soldier's strengths and weaknesses, using overall performance. If score exceeds 42 or is below 6, justify in Block J.



g. **Block G. Advancement Potential.** Rate the soldier on ability to perform in the next higher grade by considering total capacity in comparison with other individuals of the same grade and length of service. If score exceeds or meets 22 or is below 10, justify in Block J.



h. **Block H. Score.** Enter the scores from the appropriate boxes from Blocks E, F and G and total them. The sum of the scores is added by the indorser.



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i. **Block I.** Career Development. Recommendations for logical career development, such as advanced schooling and special assignments, are appropriate here.

I. CAREER DEVELOPMENT (RECOMMENDATIONS ON SCHOOLING AND ASSIGNMENTS)
Recommend DA NCO Development Course for individual.

j. **Block J. Comments.** Comments must be either typed or neatly printed.

J. 1. COMMENTS ARE MANDATORY TO JUSTIFY RATINGS IN PART II AS FOLLOWS: a. BLOCK E SCORE BELOW 10 OR OVER 40, BLOCK F SCORE BELOW 6 OR OVER 42, BLOCK G SCORE BELOW 10 OR OVER 22, OR BLOCK D IF SOLDIER DOES NOT SUPPORT ARMY'S EQUAL OPPORTUNITY PROGRAM. b. INDORSER WHO CHECKS BLOCK II B. 2. REMARKS OTHERWISE OPTIONAL.
RATER

3. **Part III.** This entry, except for signature, must be typed or printed in black ink. Use black ink for signature.

PART III RATER AUTHENTICATION			
A. ORGANIZATION AND DUTY ASSIGNMENT		B. NAME AND GRADE	C. DATE
Co C, 1st Bn, 26th Inf APO NY 09039	Sqd Ldr	CHARLIE A. DELTA E-6	5 Jan76
		D. SIGNATURE Charlie A. Delta	

4. **Counseling.** After signing the report, you should discuss the report with the rated soldier and counsel him. After counseling, you will forward the report to the indorser.

5. **See figure 1 for a completed example of a Enlisted Evaluation Report, DA Form 2166-5, as filled in by the RATER.**

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ENLISTED EVALUATION REPORT (AR 600-200)

For preparation, see DA Pamphlet 623-1.

C. SSN

PART I PERSONAL DATA

A. GRADE (ABBR) NAME (LAST) (FIRST) (MI) SSN
DOE, JOHN E. 000-00-0000

B. TYPE OF REPORT
INIT ANL CR SP
OTHER
SPECIFY

D. ORGANIZATION AND STATION
Co C, 1st Bn, 26th Inf
APO NY 09039

E. PMOSC: 11B10

F. DMOSC: 11B10

G. SMOSC: 95B10

H. PERIOD OF REPORT
BEGIN MO. JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
BEGIN YR 74 75 76 77 78 79 80 81 82 83 84 85
END MO. JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
END YR 74 75 76 77 78 79 80 81 82 83 84 85

I. NONRATED PERIOD
NO. OF MONTHS
REASON CODES

J. DUTY POSITION TITLE
Rifleman
AUTH PAY GR E-4

PART II RATINGS

A. BRIEF DESCRIPTION OF DUTIES
Soldier performs duty as rifleman in a mechanized rifle platoon. Disperses small arms fire toward enemy when required to do so.

B. INDORSER HAS NOT OBSERVED AND CAN NOT RATE SOLDIER

C. REPORT BASED ON: DAILY CONTACT (R) | FREQ OBSN | INFREQ OBSN | REPT & REC (I)

D. SOLDIER SUPPORTS THE ARMY'S EQUAL OPPORTUNITY PROGRAM: YES (R) NO (I)

E. DUTY PERFORMANCE TRAITS

TRAITS	RANKS WITH VERY BEST 5	SUPERIOR TO MOST 4	EXCEEDS OR MEETS DUTY REQUIREMENTS 3	2	NEEDS IMPROVEMENT Some 1	Much 0	SCORE R	SCORE I
1. Is well informed on all phases of assigned duties. (Scope of knowledge about duties)	R I						3	
2. Carries out orders without constant supervision. (Dependability in performing without supervision)	R I						3	
3. Shows interest and enthusiasm for duties. (Attitude toward duties)	R I						3	
4. Demonstrates qualities of leadership. (Exerts positive influence on others)	R I						3	
5. Seeks out opportunities for self-improvement. (Effort directed toward realization of potential)	R I						3	
6. Displays ability to initiate action without direction from others. (Aggressive pursuit of methods to improve duty performance)	R I						1	
7. Is successful in working with others. (Ability to work in harmony with others)	R I						3	
8. Personal behavior sets a good example for others. (High standards of personal conduct)	R I						3	
9. Takes pride in dress and appearance. (Neat and military in bearing)	R I						3	
10. Is physically fit, as required, for MOS/grade during combat. (Physical condition)	R I						4	
						TOTALS	29	

F. DEMONSTRATED OVERALL PERFORMANCE OF ASSIGNED DUTIES

	Ranks With Very Best	Superior to Most	Exceeds or Meets Duty Requirements	Demonstrates Shortcomings: Minor	Demonstrates Shortcomings: Major	SCORE
R	44 43	42 38 34	33 27 21 15	14 10 6	5 3 1	33
I						

G. ADVANCEMENT POTENTIAL
IF I HAD THE AUTHORITY AND RESPONSIBILITY TO DO SO, I WOULD: (DISREGARD TIME IN GRADE REQUIREMENTS)

	Promote Immediately	Promote Ahead of Peers	Promote With Peers	Not Promote	Deny Continued Active Duty	SCORE
R	31 30	28 26 24	22 18 14 10	7 5 3	0	18
I						

H. SCORE

BLOCKS	RATER	INDORSER
E	29	
F	33	
G	18	
SUM		

REPT SCORE: SUM + = ÷2 =

DA Form 2166-5 1 Jul 75 This form together with DA Form 2166 5A, 1 Jul 75, replaces DA Form 2166 4, 1 Jul 70, which is obsolete.

Figure 1.

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RATED SOLDIER'S LAST NAME AND SSN

PART II CONTINUED

I. CAREER DEVELOPMENT (RECOMMENDATIONS ON SCHOOLING AND ASSIGNMENTS)

Recommend DA NCO Development Course for individual.

J. 1. COMMENTS ARE MANDATORY TO JUSTIFY RATINGS IN PART II AS FOLLOWS:
a. BLOCK E SCORE BELOW 10 OR OVER 40, BLOCK F SCORE BELOW 6 OR OVER 42, BLOCK G SCORE BELOW 10 OR OVER 22, OR BLOCK D IF SOLDIER DOES NOT SUPPORT ARMY'S EQUAL OPPORTUNITY PROGRAM.
b. INDORSER WHO CHECKS BLOCK II B.
2. REMARKS OTHERWISE OPTIONAL.

RATER

INDORSER

PART III RATER AUTHENTICATION

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Figure 1. Con't.

REFERENCE:

DA Pam 623-1, Preparation of Enlisted Evaluation Reports, May 75 (page 2, para 5; pages 3 and 4, para 7)

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TASK NUMBER: 874-896-2001

CONDUCT A PERFORMANCE-ORIENTED TRAINING SESSION

CONDITIONS:

Given:

1. A training objective with the following characteristics:

a. It must be an **individual** training objective.

b. It must not require the mastery of any intermediate training objective.

c. It must be teachable within 30 minutes and judged by an individual (your evaluator/supervisor) who has demonstrated mastery of the training objective.

2. No more than 24 hours to prepare the training session.

3. No more than 10 and no less than 4 trainees who are unable to perform the training objective.

4. All other necessary resources to conduct the training (for example, training aids, an area to conduct the training, etc.).

STANDARDS:

1. The trainer must conduct the training in three phases.

a. In Phase I, he must:

(1) Explain the training objective.

(2) Insure that trainees understand the training objective.

(3) Give appropriate instruction (e.g., demonstration, talk thru) to prepare the trainees to perform the training objective.

b. In Phase II, he must give the trainees sufficient time to practice performing and make necessary corrections.

c. In Phase III, he must test the trainee's ability to perform the training objective.

2. All trainees who cannot perform the training objective at the conclusion of the training session must be identified.

3. The reason(s) for the failure(s) must be identified.

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PERFORMANCE MEASURES:

1. Insure that you clearly understand the training objective which you are to teach. If you have questions, ask your evaluator/supervisor.

a. During Phase I, you inform the trainees. This includes explaining the training objective, insuring understanding, and a demonstration. (You may decide to talk the trainees through the task instead of first demonstrating it.) Explanation of the training objective must include the task which the trainees perform at the end of the session, the conditions under which they must operate (for example, equipment given or denied and terrain), and the standard they must achieve. Estimate the time it will take to complete Phase I.

b. In Phase II, you allow the trainees to practice performing the training objective. (Do not estimate the amount of time required for this phase at this time.)

c. In Phase III, you test the trainees to determine if each one can perform the training objective. Estimate the time that it will take to test all trainees. All remaining time will be allocated to Phase II of the training session. If you properly organize available time, all trainees should be able to accomplish the training objective within the time estimated.

2. Obtain any training aids that you need. (You may find it helpful to look in appendix C, FM 21-6, Training Techniques, Aids, and Devices.) If the training objective which you have been given is contained in the Skill Level 1 Soldier's Manual, look at the "performance measures" portion of the task summary for your particular training objective. This should also give you some helpful information.

3. Rehearse the training session.

4. Conduct the training session (in three phases as described above).

5. Evaluate the results of the training session. Remember that all trainees must perform the training objective and that it is critical to identify those who cannot. Note the reason(s) for any failure(s). Reasons for failure might be: insufficient resources (time, training aids, etc.); unrealistic standards, or lack of trainee motivation.

REFERENCES:

FM 21-6, How to Prepare and Conduct Military Training, Nov 75 (chap 3, pages 8 thru 26)
TEC Lesson 901-071-0091-F, Unit Development and Training, Part 1
TEC Lesson 901-071-0092-F, Unit Development and Training, Part 2

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APPENDIX A
CONSOLIDATED LIST OF REFERENCES
(FM 7-11C1/2)

FIELD MANUAL (FM)

FM 5-15	Field Fortifications	Jun 72
FM 5-20	Camouflage	May 68
FM 5-25	Explosives and Demolitions	Feb 71
FM 5-34	Engineer Field Data	Sep 76
FM 7-7	The Mechanized Infantry Platoon and Squad	Sep 77
FM 7-8	The Infantry Platoon and Squad	TBP
FM 20-22	Vehicle Recovery	Jul 70
FM 20-32	Mine-Countermine Operations at the Company Level	Nov 76
FM 21-6	How to Prepare and Conduct Military Training	Nov 75
FM 21-10	Field Hygiene and Sanitation	Jul 70
FM 21-11	First Aid for Soldiers	Jun 76
FM 21-20	Physical Readiness Training, C1-3	Mar 73
FM 21-26	Map Reading, C1	Jan 69
FM 21-40	Chemical, Biological, Radiological, and Nuclear Defense	May 71
FM 21-41	Individual NBC Defense	Oct 77
FM 21-60	Visual Signals	Dec 74
FM 21-75	Combat Skills of the Soldier, C1	Jul 67
FM 21-305	Manual for Wheeled-Vehicle Driver	Apr 75
FM 22-5	Drill and Ceremonies, C1, 2	Nov 71
FM 22-6	Guard Duty, C1	Sep 71
FM 23-9	M16A1 Rifle and Rifle Marksmanship, C1	Jun 74

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FM 23-23	Antipersonnel Mine M18A1 and M18 (Claymore), C1, 2	Jan 66
FM 23-30	Grenades and Pyrotechnic Signals	Dec 69
FM 23-31	40-mm Grenade Launcher M203 and M79	May 72
FM 23-33	66-mm HEAT Rocket M72A1, M72A1E1, and M72	Jul 70
FM 23-35	Pistols and Revolvers	Sep 71
FM 23-65	Browning Machinegun Caliber .50 HB, M2	May 72
FM 23-71	Rifle Marksmanship	Dec 69
FM 23-90	81-mm Mortar, C1	Feb 72
FM 23-91	Mortar Gunnery, C1	Dec 71
FM 23-92	4.2-Inch Mortar, M30, C1, 2	Jun 70
FM 24-1	Combat Communications	Sep 76
FM 24-20	Field Wire and Cable Techniques	Feb 70
FM 31-70	Basic Cold Weather Manual, C1	Apr 68
FM 71-1	The Tank and Mechanized Infantry Company Team	Sep 77

FIRING TABLES (FT)

FT 81-AI-3	Firing Table, 81-mm Mortar	Jan 73
FT 4.2-H-2	Firing Table, 4.2-Inch Mortar	Aug 68

TRAINING CIRCULAR (TC)

TC 6-40-4	Fire for Effect	Mar 77
TC 21-11	Pocket Medic	Feb 77
TC 21-26	Don't Get Lost	Feb 73
TC 24-2	Communications-Electronics Operations Instructions; The Automated "CEOI"	Dec 75
TC 30-3	Equipment Recognition Guide	Apr 75

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TECHNICAL MANUAL (TM)

TM 3-4230-204-13	Decontaminating Apparatus, Portable, DS2, 1½ Quart ABC-M11	Oct 69
TM 3-4240-279-10	Operator's Manual: Mask, Chemical-Biological: Field ABC-M17A1 and Accessories	Aug 75
TM 5-2805-203-14	Operator's, Organizational, and Intermediate (Field) (DS and GS) Maintenance Manual: Engine, Gasoline, 6 HP	Jan 77
TM 5-6350-249-12	AN/GSO-151, Alarm Set, Anti-Intrusion Restricted Area (PSID)	Dec 69
TM 9-1005-213-10	Operator's Manual: Machinegun, Caliber .50 Browning, M2	Jul 68
TM 9-1005-249-10	Operator's Manual: M16A1, C1, 2	May 75
TM 9-1010-221-10	Operator's Manual: 40-mm Grenade Launcher M203	Jul 74
TM 9-1015-215-12	Operator's and Organizational Manual, C1-8	Jul 66
TM 9-1310-202-12	Operator's and Organizational Maintenance Manual: 40-mm, Cartridge	Oct 69
TM 9-1330-200-12	Operator's and Organizational Maintenance Manual: Hand Grenades	Sep 71
TM 9-2300-257-10	Operator's Manual: Carrier, Personnel, Full Tracked, Armored, M113, C1	Dec 73
TM 9-2300-257-ESC	ESC for Tracked Vehicles, C1-3	Nov 72
TM 9-2320-218-10	Operator's Manual: M151, C1	Sep 71
TM 9-2320-218-ESC	ESC for M151	Oct 72
TM 9-2320-242-10	Operator's Manual: M561	Mar 77
TM 9-2320-242-ESC	ESC for M561	Jun 73
TM 9-2320-244-10	Operator's Manual: M715, C1	Aug 68
TM 9-2320-244-ESC	ESC for M715	Jul 73
TM 9-6115-202-14	Operator's Manual: Generator Set 4.2 KW	Dec 68
TM 10-277	Protective Clothing Chemical Operation, C1	Jul 67
TM 11-5805-201-12	Telephone Set, TA-312/PT, C1	Jun 67
TM 11-5805-243-12	Telephone Set, TA-1/PT, C3-5	Sep 59
TM 11-5805-294-15	Switchboard, Telephone Manual SB-992/GT	Oct 59

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TM 11-5820-401-12	Radio Sets, AN/VRC-46 and AN/VRC-47	Sep 72
TM 11-5805-262-12	Operator's and Organizational Manual: SB-22/PT and 22A/PT	Dec 60
TM 11-5820-498-12	Radio Sets, AN/VRC-64 and AN/GRC-160	May 67
TM 11-5820-667-12	Radio Set, AN/PRC-77, C1-5	Jun 67
TM 11-6665-214-10	Operator's Manual: Radiacmeters	Nov 62
TM 21-300	Driver Selection and Training (Wheeled Vehicles), C1	Jul 67
TM 21-301	Driver Selection, Training Supervision, Tracked Vehicles	Jul 67
TM 21-306	Manual for the Tracked Combat Vehicle Driver, C1	Aug 64
TM 38-750	The Army Maintenance Management System (TAMMS), C1	Nov 72

LUBRICATION ORDER (LO)

LO 9-2300-257-12	LO (M113A1)	Oct 73
LO 9-2320-244-12	LO (M715)	Aug 73

ARMY REGULATION (AR)

AR 385-10	Army Safety Program, C1-5	Feb 70
AR 385-55	Prevention of Motor Vehicle Accidents	Apr 74
AR 600-9	Army Physical Fitness Program	Nov 76

DA PAMPHLETS

DA Pam 623-1	Preparation of Enlisted Evaluation Reports	May 75

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TRAINING EXTENSION COURSES (TEC)

COMMUNICATIONS

36-061-0137-J	Local Battery Operation for TA-312/PT

CALL FOR FIRE AND ADJUSTMENT

49-061-0001-F	Determination of Direction
49-061-0002-F	Target Location: Polar Plot and Grid Coordination Methods
49-061-0003-F	Locate a Target by Shift from a Known Point
49-061-0004-F	The Call for Fire (Revised)
49-061-0005-F	Adjustment of Field Artillery Fire, Bracketing and Creeping, Pt 1
49-061-0006-F	Adjustment of Field Artillery Fire, Bracketing and Creeping, Pt 2

COVER, CAMOUFLAGE, AND CONCEALMENT

37-061-0030-F	Cover, Camouflage, and Concealment, Pt 1

EARLY WARNING DEVICES

52-061-0050-F	Expedient Early Warning Devices, Pt 1
52-061-0051-F	Expedient Early Warning Devices, Pt 2

NUCLEAR, BIOLOGICAL, CHEMICAL

31-061-0060-F	NBC: The Mask
31-061-0061-F	NBC: Masking and When To Do It
31-061-0062-F	NBC: First Aid, Pt 1
31-061-0063-F	NBC: First Aid, Pt 2
31-061-0064-F	Individual Protection and Decontamination
31-061-0065-A	NBC: Maintenance of the M17 Series Mask

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COMBAT TECHNIQUES

020-071-1042-F	React to Indirect Fire
020-071-1049-F	Reacting to Flares

COMMUNICATIONS

936-061-0108-F	RTP: Part 1, Initiating and Responding to Radio Call
936-061-0109-F	RTP: Part 2, Writing Down Messages Received by Radio
936-061-0110-F	RTP: Part 3, Responding to Messages
936-061-0111-F	RTP: Part 4, Preparing Messages to Be Sent
936-061-0112-F	RTP: Part 5, Sending and Receiving Messages
936-061-0113-F	RTP: Part 6, Entering and Leaving a Radio Net and Authenticating
936-061-0114-F	RTP: Part 7, Practice and Self-Evaluation
936-061-0115-F	Tactical FM Radio: RT524A and R442 ID and Installation
936-061-0116-F	Tactical FM Radio: RT524A and R442: Operation
936-061-0117-F	Tactical FM Radio: RT524A and R442: Maintenance
936-061-0125-F	Field Wire Installation: Equipment
936-061-0129-F	Field Wire Installation: Maintenance and Troubleshooting
936-061-0140-F	CEOI, Part 1: How to Use the CEOI

HAND GRENADES

942-071-0001-F	The Hand Grenade - Types and Uses
942-071-0002-F	Hand Grenade Maintenance and Identification
942-071-0003-F	The Hand Grenade: Carrying, Arming, and Throwing

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LAW

948-071-0005-F	Operating the LAW
948-071-0006-F	LAW (Engaging the Target)

RIFLES

939-071-0009-F	Loading and Unloading the M16A1 Rifle
939-071-0010-F	Disassembly and Assembly of the M16A1 Rifle
939-071-0011-F	Maintaining the M16A1 Rifle
939-071-0012-F	Preventing and Correcting Common Malfunctions

LAND NAVIGATION

930-071-0013-F	Introduction to Land Navigation
930-071-0014-F	Measuring Distances and Azimuths
930-071-0015-F	Converting Azimuths
930-071-0016-F	Terrain Features
930-071-0017-F	The Lensatic Compass
930-071-0018-F	Navigating with Map and Compass

OBSTACLES

947-071-0071-F	Breaching Artificial Obstacles

M203 GRENADE LAUNCHER

940-071-0086-F	M203 Grenade Launcher: Disassembly, Assembly, and Maintenance
940-071-0088-F	M203 Grenade Launcher: Zeroing and Target Engagement

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MILITARY INSTRUCTOR TRAINING

901-071-0091-F	Unit Development and Training, Part 1
901-071-0092-F	Unit Development and Training, Part 2

MINES, CLAYMORE

947-071-0106-F	Claymore Mines, Introduction, CKT Testing, and Emplacement
947-071-0107-F	Electrical Arming and Firing
947-071-0108-F	Non-Electrical Arming and Firing
947-071-0109-F	Disarming, Recovery, and Emergency Destruction Procedures

MACHINEGUN CAL .50

941-071-0115-F	The Cal .50 MG: Mounting
941-071-0116-F	The Cal .50 MG: Mechanical Training
941-071-0118-F	The Cal .50 MG: Field Zeroing
941-071-0119-F	The Cal .50 MG: Firing

MACHINEGUN TARGET ENGAGEMENT

941-071-0125-F	Machinegun Target Engagement, Introduction

INTELLIGENCE & COUNTERINTELLIGENCE

935-071-1026-F	Collecting and Recording Information
935-071-1028-F	Processing Captured Personnel, Equipment, and Documents
935-071-1029-F	Counterintelligence

MORTAR FDC

010-071-6601-F	FDC: An Introduction
010-071-6602-F	FDC: Observed Firing Chart, Part 1

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010-071-6604-F	FDC: Observed Firing Chart, Part 3
010-071-6605-F	FDC: Observed Firing Chart, Part 4
010-071-6606-F	FDC: Modified Observed Firing Chart Method, Part 1

MORTARS

010-071-6634-F	Prepare to Fire: Mounting and Prefire Checks
010-071-6635-F	Prepare to Fire: Boresighting the 81-mm Mortar
010-071-6636-F	Prepare to Fire: Laying the 81-mm Mortar with Aiming Circle
010-071-6637-F	Prepare to Fire: Referring Sight and Placing Aiming Posts
010-071-6638-F	81-mm Mortar Ammunition
010-071-6639-F	Misfire Procedures
010-071-6640-F	Proper Maintenance of 81-mm Mortar
010-071-6642-F	Mounting/Prefiring Checks for Carrier-Mounted Mortar

TAMMS

510-091-6453-F	Preparing and Maintaining DA Form 2400
510-091-6454-F	Preparing and Maintaining DA Form 348
510-091-6455-F	Preparing DF 81
510-091-6456-F	Preparing and Using DA Form 2404, Part 1
510-091-6457-F	Preparing and Using DA Form 2404, Part 2
510-091-6458-F	Preparing and Maintaining Equipment Serviceability Criteria (ESC) Tests and Checks, Part 1
510-091-6472-F	Preparing, Consolidating, and Maintaining DA Form 2408-1
510-091-6474-F	Preparing, Maintaining, and Using DA Form 2408-1
510-091-6477-F	Preparing, Maintaining, and Using DA Form 2408-10
510-091-6478-F	Preparing, Maintaining, and Using DA Form 2408-5

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COMMUNICATION

201-113-4501-F	Preparation of Radio Set AN/PRC-77 for Operation: Pt 1, Install
201-113-4502-F	Preparation of Radio Set AN/PRC-77 for Operation: Pt 2, OP, Checks
201-113-4503-F	Preparation of Radio Set AN/PRC-77 for Operation: Pt 3, Pre-Sets

MAINT M113A1/M577A1

945-171-0051-F	Before-Operations Maint M113A1/M577A1, Pt 1
945-171-0052-F	Before-Operations Maint M113A1/M577A1, Pt 2
945-171-0053-F	During-Operations Maint M113A1/M577A1
945-171-0054-F	TBP

TRACKED VEHICLES

945-171-0100-F	Varied Terrain Driving
945-171-0101-F	Reduced Traction and Hazards

TARGET ACQUISITION

020-171-1611-F	Target Range Determination

WHEELED VEHICLES

944-441-0001-F	TBP
944-441-0002-F	TBP
944-441-0003-F	TBP
944-441-0012-F	Gamma Goat Checks and Services, Pt 1
944-441-0019-F	Gamma Goat Five Wheel Operation
944-441-0020-F	Gamma Goat Operation Under Unusual Conditions
944-441-0010-F	TBP

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FIRST AID

911-441-0028-F	Basic First Aid Measures: Stopping the Bleeding, Pt 1
911-441-0029-F	Stopping the Bleeding, Pt 2 and Controlling for Shock
911-441-0030-F	Fractures and Splinting
911-441-0031-F	Dressings and Bandages, Pt 1
911-441-0032-F	Dressings and Bandages, Pt 2
911-441-0034-F	Snake Bites and Hot Weather Hazards
911-441-0035-F	Cold Weather Hazards

PERSONAL HYGIENE

929-441-0040-F	Care of Feet
929-441-0043-F	Environment Hazards, Pt 1: Treatment of Drinking Water

GAMMA GOAT

041-091-6486-F	TBP

DEMOLITIONS

645-093-7320	Prepare a Nonelectric Firing System
645-093-7321	Prepare an Electric Firing System

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QUESTIONNAIRE

SOLDIER'S MANUAL

To provide you a better manual, please give us your comments after studying this field manual. Note that some of the questions apply to soldiers only and some to trainers only. Please fill out the following before continuing.

MOS _____ RANK _____ TIME IN GRADE _____

TIME IN SERVICE _____ UNIT _____

DIVISION _____

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CUT ON DOTTED LINE

1. The following comments are a result of my review of the Soldier's Manual for Skill Level _____.

2. My duty position is: _____

_____

_____

_____

3. The Soldier's Manual contains only the critical combat skills the infantryman needs to fight and survive on the battlefield. I think it contains:

☐ Too many tasks ☐ The right number ☐ Too few tasks

4. Are there tasks that should be added?

☐ Yes (See the list below) ☐ No

_____ Continue in block 15 if needed. _____

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5. Are there tasks that should be dropped?

☐ Yes **(See the list below)** ☐ No

Continue in block 15 if needed.

6. How difficult was it to find the tasks which you must perform?

☐ Easy, I had no trouble.

☐ Not difficult, but I think the instructions were confusing. **(Please tell us how to improve the instructions in the space below).**

☐ Difficult, I had to have someone explain how to do it.

Continue in block 15 if needed.

7. Will the Soldier's Manual help you do a better job as an infantryman?

☐ No, I don't think it will help at all.

☐ Yes, it will be a big help.

☐ Yes, but it will be better if improvements are made. **(List the improvements you would like to see.)**

Continue in block 15 if needed.

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8. **Did the conditions for each task describe the real conditions under which you usually perform each task?**

☐ Yes ☐ No, I would change:

Continue in block 15 if needed.

9. **The STANDARDS are:**

☐ Too easy ☐ Too hard ☐ About right

10. **Can the PERFORMANCE MEASURES help you perform the task to the standard?**

☐ Yes ☐ No If you check NO please explain in block 15.

11. **(Trainers only): Will the Soldier's Manual help you as a trainer in improving the combat proficiency of 11B soldiers?**

☐ Yes, I think it will be a big help.

☐ Yes, but the Soldier's Manual needs to be changed as I recommended in question 10.

☐ No, it will not help at all **(please explain in block 15).**

12. **Which of the following best tells what an infantryman must be able to do in combat?**

☐ Job Description in AR 611-201, Personnel Selections and Classification.

☐ Study Guides for MOS Tests.

☐ Soldier's Manual.

☐ 11B Study Reference Manual.

☐ Other _____

Continue in block 15 if needed.

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13. If I could make any improvement(s) in the Soldier's Manual it (they) would be:

Continue in block 15 if needed.

14. Is the artwork used in this field manual understandable and correct for each task?

☐ Yes ☐ No

If you checked no, please make suggestions concerning replacement of artwork in block 15 or enclose suggested line drawing, sketch, photo, etc., with this questionnaire.

15. Comments.

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